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Index to Advertisers—Page xl.

Principal Contents:

	PAGE
Load Building at Portsmouth	207
Vectors and the Works Engineer. By "Industrial"	210
Electrolytic Condensers. By "Microfarad"	211
Distributors in Rural Areas. By J. McCombe	213
Electrical Progress in Germany	214
Organising Cable Contracts. By J. L. G.	215
What is a Kilowatt of Maximum Demand? By G. W. Stubbings	217
Correspondence: Salaries and the Distribution Bill; The Cleaning of Mercury; Plugs and Sockets	218
New Electric Washing Machines	219
New Apparatus and Devices	220
Mains and Cables in Highways. By a Barrister-at-Law	221
Business and Industrial Notes	223
Electricity Supply	227
Contract Information	230
Personal and Social	231
Financial Section	232
Published Specifications	235
New Work for Contractors	236

Mains in Public Highways

The burden of removal costs

WE recently drew the attention of electricity supply authorities to an important matter raised in Parliament just before the adjournment. This was the attempt of two of the Yorkshire County Councils to have a special protective clause relating to the breaking-up of roads inserted in the West Yorkshire Gas Distribution Bill.

As we then mentioned, relationships between highway authorities and public utility undertakers are still virtually governed by a statute of 1847—the Gasworks Clauses Act—which in slightly modified form was scheduled to the Electric Lighting (Clauses) Act of 1899. The latter Act, following the earlier one, deals with the breaking up and reinstatement of roads by authorised undertakers and also with the removal of pipes and lines by a road authority. It is stipulated in Section 17 of the schedule to the Act that all expenses incurred by undertakers in the removal of pipes, wires or electric lines at the request of a highway authority shall be repaid to them.

Ninety, or even forty, years ago such removals were much simpler and less expensive matters than they are to-day. Consequently highway authorities desire, if they can, to avoid at least part of the cost involved in such operations. Hence they have from time to time managed to secure provisions in private Bills and Orders promoted by public utility undertakers giving them protection which was not afforded by earlier public Acts.

An Onerous Clause

The matter has recently been raised in an acute form by the proceedings in the case of the West Yorkshire Gas Distribution Bill. The Bill was introduced into the House of Lords. When it reached the Committee stage the West and North Riding County Councils sought the insertion of a clause which would have borne hardly upon the gas company but the Committee rejected it. In these proceedings the Ministry of Transport, it appears, was content merely to see that it was put on the same footing as the County Councils. Its interests, of course, are the same as those of other highway authorities, since it has assumed responsibility for some of the principal arterial roads. The general question was not opened.

When the Bill reached the House of Commons Major Milne moved:

> "That it be an instruction to the Committee dealing with the Bill to insert provisions for the further and better protection of highway authorities than is offered by the Gasworks Clauses Act, 1847, in respect of the laying of pipes and mains by the company in country roads and any other roads vested in any local authority, the filling in and restoration of such roads after the pipes and mains have been laid and the duty and expense of altering the position of such pipes and mains after any subsequent diversion, alteration or improvement of such roads."

Committee to be Appointed

Captain A. Hudson, Parliamentary Secretary to the Ministry of Transport, while agreeing that the efficacy of the 1847 Act was questionable, considered it desirable to leave the Committee to decide what form of protection should be inserted in the Bill as this might be considered a special case on account of the large area involved, although how the size of the area affects the general principle is not quite clear. He also said that the Minister proposed to consult with the other Government Departments concerned with a view to seeing how far the Gasworks Clauses Act of 1847 was still applicable. Consequently when the Bill was considered by a House of Commons Committee the County Council's clause was again rejected in favour of one which was not likely to be so onerous to the gas company.

The outcome of the discussions was the announcement just before the adjournment of the Government's decision to set up a Joint Committee of both Houses to consider the whole question. This leads us to repeat our warning to electricity supply authorities to keep a close watch on the matter lest they be called upon to shoulder an unwarrantable burden of expense. This warning is reinforced by a legal correspondent in this issue (page 221).

The B.A. Meeting

THE annual meetings of the British Association for the Advancement of Science are regarded by many as a species of beanfeast for the grave and reverend seniors of the scientific world. This is a misapprehension, for, although the gatherings attract many of the leading scientists (and would not be the same without them), many hundreds of younger workers participate year by year. We consider that an innovation to be adopted this year will help to dispel any false views which may be held: it is the presentation of short papers in the Engineering Section by junior engineers. Among the other proceedings of the Section will be a joint discussion with the Mathematical and Physical Section on magnetic measurements, to which many well-known men in this field will contribute.

Television Prices

ALTHOUGH it may come as a surprise to the public, it is no surprise to the wireless engineer that television sets should now be announced at £30 or less. If the quantities produced had been sufficient, these prices could have been possible a year ago. They are only feasible to-day on the assumption of a quantity factory production as compared with the more or less individually built sets which have supplied the limited market hitherto. At prices around £30 we believe manufacturers have gone as far as they dare for a long while to come. The industry could not, at this stage of television, take risks with reliability and quality such as would occur at lower price levels. Sets will be marketed below £30, but these will give a smaller picture than the present standard. These sets will not be any less reliable on that account and will contribute considerably to popularising television reception by the general public.

Kentish Enterprise

WHEN Mr. A. J. Abraham relinquishes the control of the Bexley undertaking at the end of the year he will leave the foundations well laid for intensive development but not much scope for obtaining new consumers. This is shown by the fact that the number at the end of March last had reached 29,211, while there were somewhat fewer actual premises in the area. Although not much spoken of, the Bexley undertaking has an exemplary record of electrical expansion, and in the past decade the growth in sales has not once dropped below 20 per cent., indeed, the average is well above that level. In three years the sales of electricity have been doubled, whereas the country as a whole has taken six years to do this. While building development in the area has largely made this possible, it is a tribute to Mr. Abraham's Department that the opportunity has been seized so wholeheartedly.

Industrial Casualties

THE 9 per cent. increase in both fatalities and total number of industrial accidents in 1937 is attributed to greater industrial activity, especially in areas where heavy industries predominate. H.M. Chief Inspector's annual report, to which reference is made on another page, contains the usual melancholy tale of many accidents resulting from disregard of the most elementary principles of safety. Apart from the speeding-up of operations and the longer hours worked in many factories, a factor of importance was the employment for the first time of large numbers of unskilled, or partly trained, persons in consequence of the shortage of skilled labour. The new Act, which came into force last month, will play its part in reducing certain classes of mishap, but the only real remedy is, as always, the exercise of reasonable care for themselves and forethought for others on the part of all concerned. The changes embodied in the new Act are both numerous and complex, and will necessarily entail much more executive action; twenty-three new inspectors were appointed last year, and a further fifty-one to be appointed over a period of three years will raise the total to 332. The greater number of electrical accidents in 1937 was in part due to the greater use of electricity in industry. While there were rather more fatalities than in previous years, the number is too small to be acceptable by itself as evidence of any general increase. Reported cases of lead poisoning were fewer than in any year since the disease became notifiable, but the report sounds a note of warning that the manufacture of electric accumulators was "again being taken up by persons not fully alive to the serious risk." The number of electric accumulator works subject to the regulations was 272 in 1937!

Large Fault Currents

IN the electricity supply industry much attention has been focused on fire precautions, and the report directs special attention to a new source of risk that is said to be becoming serious, namely, the rendering of switchgear installed by large consumers insufficient to deal with faults consequent upon growth of system capacity. One wonders whether Regulation 8 could be deemed to apply to these cases? The inspectorate definitely considers that it imposes a legal obligation in the case of failure in the bus-bar zone, for this regulation requires measures to be taken which will prevent danger from excess current, the word "danger" being a defined term which includes fire risk. It is argued that the obligations cannot have been fulfilled if life or limb are endangered, or a fire is caused, by excess current following a failure.

Factory Lighting

FOR the first time in factory legislation in this country, both sufficient and suitable lighting will be required in factories generally by Section 5 of the new Factories Act. The standards are to be prescribed by the Secretary of State, but meanwhile many antiquated installations are being voluntarily replaced, and it is encouraging to learn that in several instances improvements in illumination have been directly due to visits to the Home Office Industrial Museum, which contains an exhibit illustrating the principles of good lighting, and continues to perform the functions of an information bureau on all the ramifications of the Factory Acts. Nearly 90,000 people have visited it since it opened eleven years ago, and last year 230 new items were placed on view, while seventy exhibits were renewed or reconditioned free of charge to ensure that they comply with the new Act.

Frequency Standardisation

UP to the end of March £2,127,725 had been spent on the standardisation of frequency which is proceeding under the Central England Electricity Scheme. One interesting consequence of this programme is that mains and plant are made available in readiness for the time when they will be required by the development of the undertakings concerned. At Birmingham besides this advantage the Corporation has reached a very satisfactory settlement with the Central Electricity Board, which defrays the cost in the first instance. It had already paid £230,000 to the Board, and is now to pay a further £172,000 in full settlement of its liability in respect of such plant and mains, so that it will have paid £402,000 for assets which originally cost £737,000.

Still in Service

IT is pleasing to know that the famous Ferranti 11,000-V cable which was installed in London in the 'nineties, although now disinterred, is to continue its service in another sphere. The London Electric Supply Corporation, Ltd., has recently presented a quantity of the cable to the Electrical Industries Benevolent Association. Twelve yards of this has been purchased from the Association by Ferranti's and the remainder is being cut up to form paper weights or larger souvenirs which will be sold at from 5s. each. It is due to Mr. Howard Marryat and Mr. E. E. Sharp to recall that they provided similar souvenirs for the benefit of the Association two or three years ago.

Load Building at Portsmouth

A review of recent progress

In the past five years the number of consumers, the sales of electricity and the maximum demand at Portsmouth have all been practically doubled. Progress has been mainly on the domestic side, though agricultural and industrial consumption has also been encouraged by the attractive facilities which are available

BUT for the casting vote of the Mayor, Portsmouth would probably never have possessed its own municipally operated electricity undertaking. Fifty years ago a private company was seeking permission to obtain an Order to supply electricity to the borough, and it was only after much discussion that the Town Council decided to apply for an Order itself. This Order was duly granted in 1890 and the public supply was inaugurated with about seventy consumers in June, 1894.

Once having "taken the plunge," the Council has spared no effort to improve and cheapen the supply and to extend its facilities to neighbouring districts. As a result, Mr. B. Handley, the city electrical engineer and manager, can now claim over 85,000 consumers supplied directly by the Corporation, not to mention those who are served by the bulk supplies furnished to the Chichester Corporation, the Fareham Urban District Council, and the Mid-Southern Utility Co., Ltd., for its Petersfield and Midhurst undertakings. Last year sales of electricity amounted to no less than 123 million kWh.

[Elec. Rev. photo.

Electric vehicles are becoming very popular in Portsmouth. The "Co-op" alone has about sixty, including fifteen milk delivery "prams" like the one shown above

The Corporation's original supply area covered the borough of Portsmouth, which at that time comprised only a part of Portsea Island. When the borough was extended in 1904 to include the whole of Portsea Island and in 1920 an area on the mainland, the electricity supply area was also extended to conform with the same boundaries. Since then various Special Orders have been obtained covering Havant and Waterloo and parts of the Fareham, Droxford, Petersfield and Chichester districts, the most recent addition to the area being the borough of Gosport, which was taken over in April, 1936. Altogether the area now comprises almost 200 sq. miles with a population of 354,000, 95 per cent. of whom are within reach of supplies. Actually, about 80 per cent. of the premises in the area use electricity.

Domestic Consumption Trebled

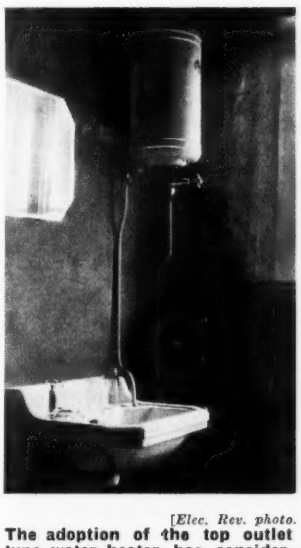
The area is very largely a residential one and over a half of the electricity sold last year was taken by the 74,000 domestic consumers. Their actual consumption was 50 million kWh, which compares with 41 million kWh in 1936-37 and only 16 million kWh five years ago. This remarkable progress is largely due to the attractive electricity tariff and apparatus hire and hire-purchase charges. Approximately five-sixths of the domestic consumers favour the two-part tariff which in the city area comprises a quarterly fixed charge based on floor area (ranging from 7s. 6d. for premises of under 800 sq. ft. to £3 8s. 6d. for up to 16,000 sq. ft.), plus a "unit" charge of 0.4d. in the summer and 0.6d. in the winter. Outside the city the charges are slightly higher; the fixed charge ranges from 9s. 5d. to £4 5s. 7d., the "unit" charge being 0.5d. in the summer and 0.65d. in the winter. The alternative flat-rate charges are: Lighting, winter, 5d. per kWh (6d. outside the city), summer, 4½d. (5½d.); heating and power, 1d. (1½d.) with rebates upon their bills in the case of large consumers.

[Elec. Rev. photo.

This reminder of the cheapness of electricity is one of the first things that meet visitors' eyes on entering Hayling Island

Hire schemes for apparatus have been gradually introduced during the past few years, starting with radiators and cookers in 1924, followed by kettles, water heaters and wash boilers between 1925 and 1930, and finally, in 1936, by refrigerators. The past four years have seen a big increase in the popularity of electric cookers, and nearly two thousand have been added each year, the total on hire at March 31st last standing at 11,506. Solid type boiling plates are fitted as standard, though experiments are now being carried out with the new Backer-Jackson semi-radiant plate. The Department possesses a well-equipped cooker repair shop and obsolescence difficulties have been minimised by reducing the rental by half a crown a quarter after two years. Whenever a cooker is installed one of the Department's engineers calls on the housewife and explains the general principles of electric cooking. This is followed up by a visit from a lady demonstrator.

Water heaters have gone ahead steadily since it was decided in 1933 to install the wiring free, and over two thousand have been fitted in each of the past three years, there being 10,277 on hire at the end of March. The 1½-gal. size is by far the most popular type, and it is found that practically every home with an electric cooker installs one sooner or later. The furring up of water heaters, Mr. A. Watson, the consumers' engineer, tells us, has been considerably reduced since the top outlet type of heater was adopted three years ago. Apparatus now needs to be cleaned only once every 12-18 months instead of every 6-9 months.



[Elec. Rev. photo.

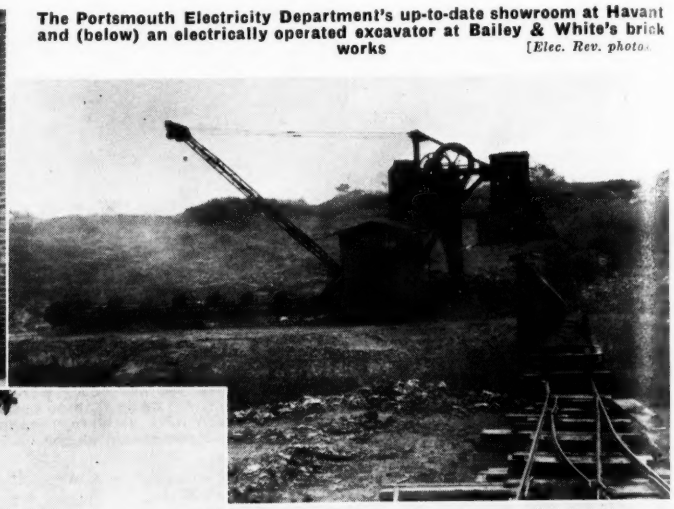
The adoption of the top outlet type water heater has considerably reduced furring difficulties. This is one of the 1½-gal. units installed in every bedroom at the Coronation Camp at Hayling

It is only within the last three years that wash boilers have "caught on," but over 500 a year are now being connected, the number on hire now being about 2,200. Last year 115 3-cu. ft. refrigerators were installed under the "half-a-crown a week for five years" scheme, which includes free maintenance and wiring up to 20 ft. At March 31st there were 159 on circuit and the scheme has now been extended to cover the 2-cu. ft. model, which is available at 1s. 11d. per week.

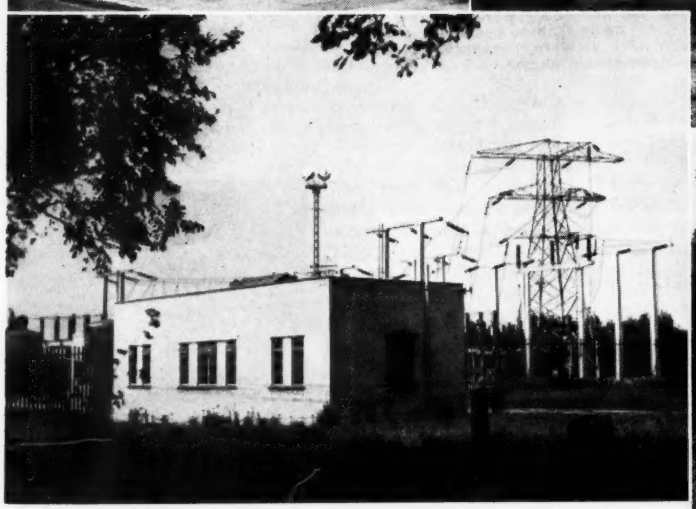
Apart from hire schemes, facilities were introduced in November, 1935, for supplying any apparatus on hire-purchase terms at list prices

spread over five years. Just recently hire-purchase has been extended to cover ground-base saucepans. Altogether on hire and hire-purchase there are now 27,000 pieces of apparatus installed. Development on the domestic side has also been encouraged by an assisted wiring scheme started in 1929, about 2,000 connections a year now being added by this means. The total of assisted-wiring consumers is now about 12,000.

Opportunities have already been taken to provide showrooms in the most densely populated portions of the area and the Department is now turning its attention to the smaller towns and villages, the most recently opened building being situated facing the sea at Lee-on-Solent. Other up-to-date showrooms for the outer districts are now in service at Cosham, Havant, Gosport and Parkgate, while a few years ago new premises were opened at North End to cater for the needs of those consumers in the city who lived rather out of reach of the main showrooms in Greetham Street. Cooking demonstrations given regularly at these showrooms twice a week attract good attendances. The electrical education of the smaller villages in outlying districts which do not yet justify showrooms of their own is not being neglected and at least once a year small



The Portsmouth Electricity Department's up-to-date showroom at Havant and (below) an electrically operated excavator at Bailey & White's brick works [*Elec. Rev.* photos



The main grid sub-station at Wymering and (right) drawing in an 11-kV cable at a new sub-station just erected to serve the Peel Common district

exhibitions and demonstrations are arranged in the local halls. Occasionally empty shops are taken and their windows are filled with domestic appliances. The Department also participated recently in an exhibition held in connection with the Royal Sanitary Institute's Health Congress held at Portsmouth.

Progress on Farms

The attractive tariffs now available (the domestic two-part charge is applicable to farms) are expected to encourage considerably the use of electricity for agricultural purposes. At the moment just over a hundred farms are taking supplies of electricity, but as a rule for lighting only. Last year they consumed between them about 76,000 kWh, which was over 50 per cent. more than in the preceding year. Poultry farms of which there is a large number in the district appear to offer the most immediate market for electricity and several are already using it extensively for such purposes as incubator and brooder heating and ventilating, food preparation, plucking, refrigerating and pumping. One poultry farmer in Hayling Island, Mr. A. C. Arbuthnot, who produces about 2,000 table birds a week, used no less than 50,000 kWh last year.

Apart from the Dockyard, which generates its own electricity, Portsmouth cannot be said to possess any outstanding industries of its own. Last year, industrial power supplies were taken by 855 consumers, who together utilised about 13¼ million kWh. Of this total a large proportion was accounted for by Brickwood's brewery (1 million kWh); various brickfields (1,200,000 kWh); the "W.B." and "Twilfit" corset factories (400,000 kWh); the Airspeed aeroplane works (614,000 kWh); Fraser & White's coal handling plant (200,000 kWh); Camper & Nicholsons yacht building works, from which *Endeavour I* and *II* came (200,000 kWh); Stent's glove factory (150,000 kWh); and various engineering and timber works, dairies, laundries, printing works and other public utility undertakings.

Public Buildings

Shops also provide a useful load and last year the 8,000 premises connected took 14¼ million kWh, an increase of just over a million kWh as compared with the previous year. Public buildings (nearly 700), including schools, places of entertainment, hospitals and public baths, used almost 5¼ million kWh. Cinemas in particular are regarded as an excellent load and the thirty-five or so in the area received their 1¼ million kWh last year at an average price of approximately 1¼d. per kWh. Offices (590) took just over a million kWh (more than half as much again as in 1936-37), and hotels (32) 665,000 kWh.

A new class of consumers have come into existence with the popularity of holiday camps, which appear to find the provision of a 1½-gallon water heater in each bedroom a solution to their hot-water problem. In the Portsmouth area there are four of these camps consuming annually about 81,000 kWh. At one we visited, the Coronation Camp in Hayling Island, the electrical installation includes, in addition to the water heaters in every room of the twenty-one five-roomed bungalows, two Jackson cookers, a Crypto potato peeler, a T. Errington & Son's drying cabinet for plates, a large Kelvinator refrigerator and a stage lighting system complete with dimmer in the recreation room.

The bulk supplies to neighbouring authorities already mentioned, amounting to 28 million kWh, together with the supplies to the Southern Railway, furnished by the Central Board by agreement with the Corporation, add considerably to the electrical demand in the area. The Department is fortunate in still being able to claim a substantial traction load, the city's trolley buses which now have entirely replaced the trams,

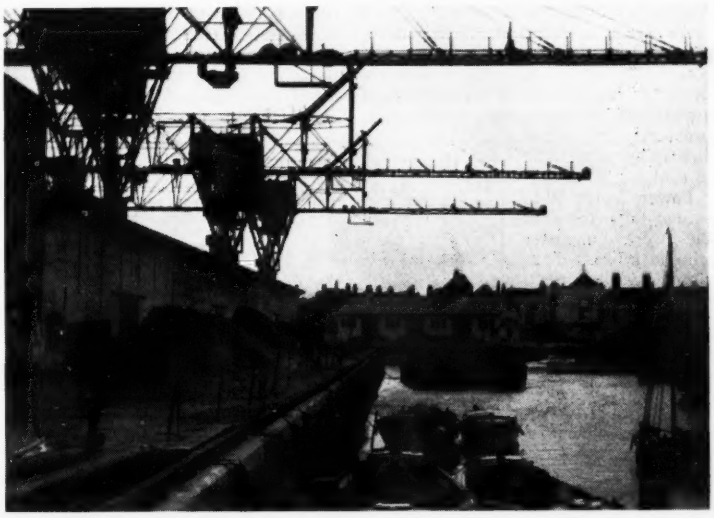
requiring over a million kWh annually. Following the good example set by the Electricity Department itself, many business concerns, particularly bakeries and dairies, are rapidly learning to appreciate the advantages of electric vehicles for local delivery work. They are offered a specially attractive off-peak rate (¼d. per kWh) for charging and at the moment there are just over a hundred in service. The Portsea Island Mutual Co-operative Society is a particularly enthusiastic user and has about sixty in operation, including fifteen milk delivery "prams"

Portsmouth is often referred to as one of the best lighted provincial cities. Electric street lighting has been undertaken ever since the Electricity Department was formed and it has been continually brought up to date without calling upon the rates. There are now about 720 electric discharge lamps and nearly 5,000 tungsten lamps in the city and it is proposed to change over gradually all the main streets to electric discharge lighting.

The rapid growth of the undertaking in recent years will be appreciated when it is noted that in only five years the number of consumers, sales of electricity and the maximum demand have all been practically doubled. The actual figures are:—Consumers, 46,124 at March 31st, 1934, 85,255 at March 31st, 1938; sales of electricity, 61 million kWh in 1933-34, 123 million kWh in 1937-38; maximum demand 29,550 kW in 1933-34, 49,600 kW in 1937-38. This advance has been accompanied by a reduction from 1.54d. to 1.24d. in the average revenue per kWh sold and with an increase from £312,016 to £559,111 in revenue from sales of electricity. This achievement is all the more remarkable since the undertaking is the most highly rated concern in the area, paying rates equivalent to those of the next two highly rated public utility undertakings added together. In addition to the ordinary rates the undertaking has paid £121,377 in the relief of rates since its inception. Furthermore, progress has been to some extent restricted on account of intense competition on the part of the gas undertaking which offers the exceptionally low rate of 7d. a therm.

To cope with all the developments we have mentioned the generating and distribution system is constantly being brought up to date and extended. Last month, as described in our July 22nd issue (p. 117) a new 30,000-kW generator was put into commission at the Department's "selected" station, bringing the capacity of the plant installed there to 62,500 kW.

The original generating plant, consisting of three 200-kW sets with five Lancashire boilers, was of some historical interest, as it included what are believed to be the first alternators erected in a public generating station direct coupled to steam engines. The plant now in service comprises one 30,000-kW set, two 10,000-kW sets, two 5,000-kW sets, and one 2,500-kW set, together with twelve boilers of a steam capacity of 700,000 lb. per hour.



[Elec. Rev. photo.

Fraser & White's coal-handling plant, of which a portion is shown above, accounts for approximately 200,000 kWh a year

The unenviable task of changing over 40,000 consumers from 100 V a.c. to the standard 230/400-V, 4-wire, 50-cycle system took about six years to complete and was carried out entirely by the Department's staff. The system now comprises approximately 900 miles of mains, of which 355 miles are e.h.v. (23 miles overhead) and 549 miles l.v. (7 miles overhead).

Our thanks are due to Mr. Handley and his staff for their assistance in compiling these notes.

Flameproof Electrical Equipment

Certificates recently issued

THE quarterly schedules of electrical equipment for which certificates of flameproof enclosure have been issued are, at the request of B.E.A.M.A., now obtainable for 1s. 2½d. per copy (post free) from the Mines Department, Dean Stanley Street, London, S.W.1. Numbers in parenthesis indicate whether the appliance has been tested in (1) methane, (2) petroleum and acetone vapour, or (3) coke-oven and coal gas.

The list for the three months ended June 30th, 1938, includes the following items:—

Anderson, Boyes & Co., Ltd.: (1) trailing cable coupler for 100 A at 660 V with electrically interlocked plugs; d.c. airbreak starter for 15 A at 200/600 V with interlocked incoming plug and outgoing cable box.

British Insulated Cables, Ltd.: (1) three-core bolted cable coupling for 250 A at 3,300 V.

British Thomson-Houston Co., Ltd.: (1 and 2) airbreak contactor and auto-transformer starters; (2) large and small slip-ring units; (1 and 2) slip-ring and squirrel-cage motors.

Crompton Parkinson, Ltd.: (2) 0.33-h.p. motors with switches, d.c. 32-40-50-250 V; single phase up to 250 V and three phase up to 440 V at 25-40-50-60-75-100 cycles.

James Dawkins & Co., Ltd.: (1) a.c. and d.c. distribution panels for 150 A up to 660 V with coupling units to form multi-panel boards.

Electrical Apparatus Co., Ltd.: (2) single push-button box for up to 650 V, a.c. or d.c.; (1 and 2) airbreak stator and rotor control panel, auto-transformer starter, airbreak star-delta control panel, three phase, 225 h.p. at 650 V; (2) d.c. control panel of 25 h.p. at 650 V with alternative interiors for hand or automatic actuation; also three-phase motor control panel for 60 A at 600 V.

Electrical Power Engineering Co. (B'ham), Ltd.: (1 and 2) d.c. motors of 0.375 to 3.5 h.p. at 600 V with cable sealing box or electrically interlocked plug connector.

Erskine, Heap & Co., Ltd.: (1 and 2) oil-immersed rotor starter.

General Electric Co., Ltd.: (1 and 2) well glass fitting for 125/200 W lamps; (2 excluding acetone) tubular heaters of various lengths up to 60 W per ft. at 100-250 V, also 1,000 W floodlight fitting; (1) three-phase squirrel-cage conveyor motors of 6-12 h.p. at 550 V.

Gent & Co., Ltd.: (2) bell-ringing transformer.

Heyes & Co., Ltd.: (1 and 2 excluding cellulose paint processes) well-glass fittings for 100/150 W lamps.

A. Hirst & Son, Ltd.: (1) truck-mounted shot-hole drive motors of 4 h.p., three phase at 600 V and d.c. at 500 V, with alternative cable connectors.

M. & C. Switchgear, Ltd.: (1) trailing cable coupler of 100 A up to 660 V with electrically interlocked plugs; (1 and 2) d.c. airbreak faceplate starter of 10-20 h.p. at 230-600 V with isolator and alternative cable connectors for factory installations.

Mather & Platt, Ltd.: (1 and 2) frame ventilated motors, 120-220 h.p. d.c. at 650 V and up to 450 h.p. at 6,600 V slip-ring and squirrel-cage.

Mavor & Coulson, Ltd.: (1) shaker conveyor motor and starter, squirrel-cage, 15 h.p. at 220-650 V, 30-60 cycles.

Metropolitan-Vickers Electrical Co., Ltd.: (1 and 2) medium and small slip-ring units for 650 V with and without brush-lifting and short-circuiting gear; also slip-ring motors of 8-350 h.p. for 650 and 3,300 V, three phase; (2) squirrel-cage motors; (1 and 2) airbreak off-load reversing switch for 150 A at 3,300 V, oil-immersed face-plate rotor starters up to 500 h.p. at 750 V a.c., airbreak limit switch for 10 A at 650 V with alternative backing-out or change-over features.

Mining Engineering Co., Ltd.: (1) squirrel-cage motors and (1 and 2) d.c. motors.

Bruce Peebles & Co., Ltd.: (1) surface cooled slip-ring motors of 5 to 131 h.p. at 220-650 V.

A. Reyrolle & Co., Ltd.: (1 and 2) draw-out pillar type switchgear for 200-600 A at 660-3,300-6,600 V; also meter enclosure.

Walsall Conduits, Ltd.: (2) d.c. push-button boxes for 2 A at 120 V and multi-way switch and fuse boxes for 8-30 A at 500 V.

Modifications to gear previously certified are excluded from this list, but it includes some small appliances at present only accepted for provisional test in group (3) for which certificates have not yet been issued.

Vectors and the Works Engineer

By "Industrial"

Minimising mathematics

THE average works or plant engineer will probably have neither the time nor inclination to study any mathematical exposition of a.c. theory. He will, however, much more clearly understand and mentally visualise the performance and operating conditions of circuits and apparatus that may be under his supervision if a certain facility is gained in vector representation, with the minimum of mathematical application, in connection with power factor and associated problems with which he may be called upon to deal.

Power factor is of special importance to the works engineer who is interested in obtaining the maximum benefit from the tariff applicable or in running his plant, cabling and distribution system at maximum efficiency. The majority of these problems can easily be solved vectorially.

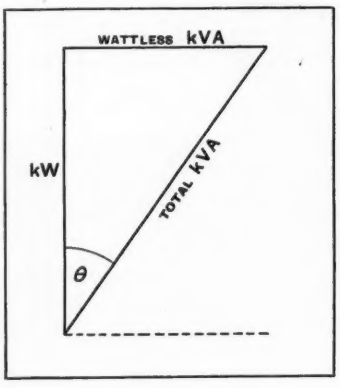


Fig. 1.—Simple diagram of general a.c. relations

In using rotating vectors, two fundamental requirements must be observed: (1) They must be assumed to represent sinusoidal quantities. (2) The frequencies of the considered quantities must be identical so that phase difference between them as shown in a diagram may be constantly maintained. It is well to note that a complex wave, *i.e.*, one which contains various harmonic frequencies in addition to the fundamental, cannot be represented in a simple vector diagram. This follows since the representation of the harmonics would call for the use of individual vectors rotating at various frequencies. The consideration of such conditions will not, however, normally trouble the average works engineer.

Also, the power factor of a circuit to which a complex wave is applied cannot be accurately defined by reference to the cosine of an angle. Power factor may still, however, be defined as the ratio of useful to apparent power. In the case of unbalanced systems the interpretation of the definition is complicated by reason of the differing phase currents and the possibly unequal phase angles between these currents and their associated voltages.

Simple Vector Diagram

The type of vector diagram which the plant engineer will find useful is shown in fig. 1, which illustrates some general a.c. relations, where θ is the angle of lag. These relations are, of course:

Cos θ=power factor=kW/total kVA. Sin θ=wattless kVA/total kVA. Tan θ=wattless kVA/kW.

The works engineer will find that much of the difficulty which is experienced in the clear exposition of power factor conditions may be greatly clarified by resorting to the relations of the simple vector diagram shown. From the geometrical relations of the figure it can be seen why a low power factor is uneconomical, and capital expenditure upon corrective apparatus is therefore usually justifiable, thereby reducing the total kVA figure for a given kW loading. The simple trigonometrical quantities involved do not present much difficulty.

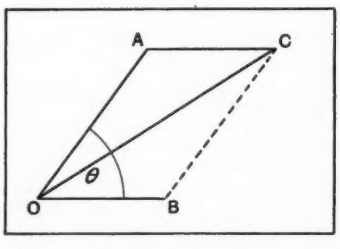


Fig. 2.—Vector resultant parallelogram

Vector Resultants

To the non-technical man one of the difficulties about a.c. is that quantities cannot, in general, be combined arithmetically, but only vectorially. This follows, of course, by reason of phase differences which may exist between the quantities. To find the resultant of any two vectors denoting a.c. quantities, the parallelogram construction may be used, as in fig. 2.

Its magnitude may be calculated mathematically from the formula $R=\sqrt{OA^2+OB^2+2OA.OB.\cos\theta}$, in addition to being measured graphically.

When more than two vectors are to be combined the continued application af the parallelogram construction is apt to prove laborious. It is then more convenient to determine the vector resultant by summing the projections of the individual vectors upon two axes at right angles to each other. The magnitude of the resultant is then given by $R=\sqrt{(a+b+c.....)^2+(a'+b'+c'.....)^2}$, where a and a', b and b' are the projections of the individual vectors upon the two axes. One of the two axes is usually taken as being coincident with one of the vectors, this vector then having its full magnitude along one axis and a zero projection upon the other.

Current in the Neutral

In general, industrial electrification is upon the four-wire system of distribution, this being suitable for mixed loads of power and lighting. If the loads are well balanced, the four-wire system is economical in copper since the neutral only carries the vectorial sum of the phase quantities. It is very desirable for the works engineer to determine the out-of-balance current flowing in the neutral since this may not be constant owing to alterations, extensions, &c., and it is instructive to make this determination by the use of vectors.

Vectorial representation will also determine the phase angle of the resultant current with reference to any phase quantity, and conditions can be visualised completely.

We will assume that the phase currents due to a works lighting load are respectively 100, 150 and 175 amperes, these being measured values. These three vectors may be set out as shown, any one vector being taken as a reference axis: in this case the 100-A vector is coincident with the vertical axis. Components are taken in phase and in quadrature with the 100-A load. The resultant current component in phase with this load

$$=100-150 \sin 30 \text{ deg.}-175 \sin 30 \text{ deg.}$$
$$=100-(150+175) \sin 30 \text{ deg.}$$
$$=-62.5 \text{ A.}$$

The negative sign indicates that this resultant is opposed in sense to the 100-A vector, and is shown by the dotted line in fig. 3.

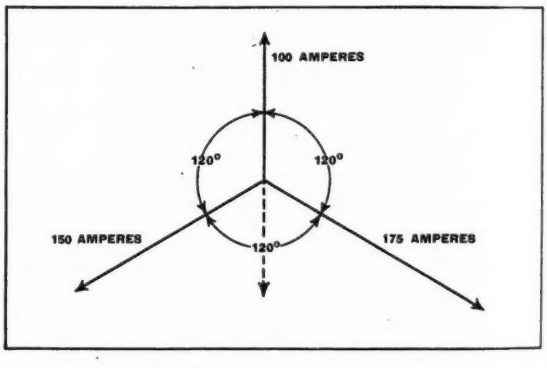


Fig. 3.—Current flowing in neutral

The resultant current component in quadrature (at right angles) with the 100-A vector

$$=175 \cos 30 \text{ deg.}-150 \cos 30 \text{ deg.}$$
$$=25 \cos 30 \text{ deg.}=12.5 \text{ A.}$$

The magnitude of the resultant is given by the usual formula:

$$R=\sqrt{(-62.5)^2+(12.5)^2}=63.7 \text{ A.}$$

This is the out-of-balance current flowing in the neutral with the loads as stated. This problem could, however, be solved graphically.

Phase Angle of Resultant

We can also determine the phase angle of the resultant current with reference to any phase vector. The tangent of this angle with respect to the 100-A vector is given by:

$$\frac{\text{Sum of horizontal components}}{\text{Sum of vertical components}}=\frac{12.5}{-62.5}=192 \text{ deg.}$$

With respect to the 150-A vector the resultant therefore has a phase angle of 72 deg.

In paralleling a new transformer to an existing distribution system the setting out of the appropriate vector relations is of primary importance. In order to operate them successfully in parallel two transformers should possess: (1) The same

voltage ratio; (2) the same inherent phase-angle difference between primary and secondary terminals; (3) the same polarity; (4) identical phase rotation; and (5) the same percentage impedance. In the case of single-phase transformers we are not concerned with characteristics (2) and (4) and hence parallel connection is simplified.

Phase sequence and vector relations are intimately associated and the voltages induced in the limbs of a three-phase transformer may be shown by three vectors spaced at 120 deg. The phase sequence—the order in which voltages reach their maximum value—is initially determined by the supply to which the transformer is connected, but the secondary sequence is determined by the manner in which the primary is connected to the supply. The study of vector relations is specially important in paralleling transformers since the fundamental requirement for successful connection is that when the vector diagrams of the transformers are superimposed on each other, their terminal points shall be coincident. The B.S.S. for transformers groups together those types which are suitable for parallel connection.

Electrolytic Condensers. By "Microfarad"

Notes on their characteristics, construction and use, with particular reference to their application to a.c. capacitor motors

ON account of its smaller bulk and consequent lower cost for a given capacity the electrolytic condenser is being increasingly used in electrical practice. Large numbers are used in radio sets, and to assist the starting of single-phase motors, known as the capacitor type, which are used to drive appliances that need a better starting torque than that possessed by the split-phase motor, a case in point being the electric refrigerator.

Fig. 1 represents diagrammatically the split-phase-start single-phase motor which consists of a squirrel-cage rotor A with two windings (ignoring E for the moment), of which B is permanently connected to the supply mains when the motor is running. Winding C is of different reactance and resistance to the running winding.

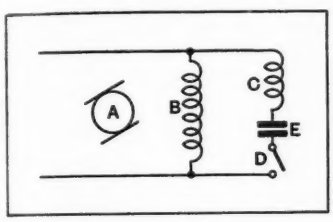


Fig. 1. — Capacitor start motor

It is connected to the mains through switch D which is closed when the motor is at rest, but is arranged to be opened (usually automatically by centrifugal or magnetic action) when the motor has run up to speed, and so cuts the starting winding out of circuit.

The action of the auxiliary winding is to produce a magnetic field out of phase with that produced by the main winding. The value of this phase displacement is limited and hence the starting torque is also limited, but they are improved by connecting a condenser in series with the starting winding as at E. The capacity of the condenser needs to be fairly high, often 25 to 30 μF for a ½ h.p. motor, and would therefore be both bulky and expensive if the usual condenser construction were followed; also, the starting winding and condenser are only in circuit for the fraction of a second that the motor takes to gain full speed.

In the diagram of a condenser (fig. 2) A represents a plate or electrode connected to one side of the supply, B another electrode connected to the other side of the supply, and C the dielectric, which may be mica, paper, air or other non-conductor of electricity. The greater the area of the plates, and the closer they are together, the greater the capacity. Thus, the dielectric should be as thin as possible, consistent with its ability to withstand the electrical pressure applied to the two plates without breaking down.

An electrolytic condenser is essentially similar, but with the important difference that while A remains a true plate as before, the dielectric now consists of a layer of oxide D formed on the plate itself. In contact with this oxide layer is a chemical electrolyte C which may be liquid or paste-like in form. This serves as the other electrode of the condenser, the bottom plate B now merely serving as a convenient means of maintaining contact with the electrolyte, and taking no part in the action of the condenser.

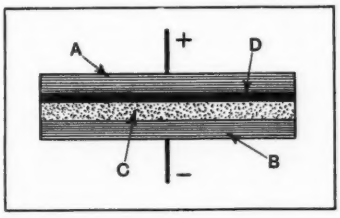


Fig. 2.—Simple electrolytic condenser

Important points are that the film of oxide D is of microscopical thickness, with correspondingly much higher capacity than a similar sized condenser with a separate dielectric. The resistance of the oxide film, or its dielectric strength, acts in *one direction only*. If a direct current be applied with the positive lead on the oxide coated (or formed) electrode the oxide will act as a non-conductor and the arrangement will function as a condenser; but if the conditions are reversed, the oxide film will become a conductor and there will not be any condenser action.

Thus the arrangement shown in Fig. 2 (which is used in radio work where the current is unidirectional, except for the impressed ripple) is unsuitable for use with a.c. motors, and condensers for this application must have both plates "formed," with an oxide film on each, so that the film on A acts as the dielectric for half a cycle, then for the other half cycle when the current is in the reverse direction the oxide film on B becomes the dielectric. The dielectric which is in reverse at any particular instant takes no part in the operation of the condenser at that moment.

If the oxide film breaks down at any point it is automatically repaired, due to the fact that the leakage current at the point of breakdown must of necessity flow through the electrolyte C, which it decomposes, so setting free oxygen to combine with the material of the plate to form fresh oxide. As soon as fresh oxide is formed the leakage current due to the fault ceases. There is always a small leakage current flowing when the condenser is in use. Should the electrolyte become exhausted it would no longer be able to supply oxygen to repair any breaks in the oxide, and the condenser would then be at the end of its useful life. In other words, while the life of a solid dielectric is indefinite, that of an electrolytic condenser is limited.

Construction and Maintenance

There are three types of electrolytic condenser, known as wet, semi-wet, and dry. These terms refer to the state of the electrolyte, which may be liquid, a thick liquid similar to treacle in consistency, or a comparatively dry paste, respectively. Practically all condensers used in small motors are of the dry type, and the electrolyte is originally in the form of paste, which is soaked into, or pasted on what is known as the separator, composed usually of fibrous absorbent paper, or woven cotton gauze, or a combination of the two. The plates are usually made of two strips of thin aluminium foil.

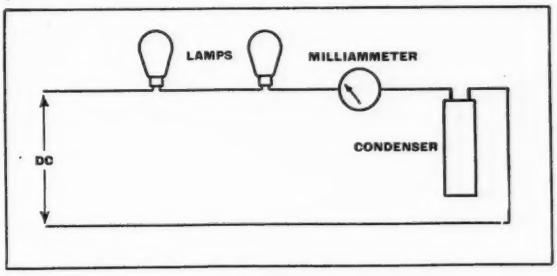


Fig. 3.—Forming condenser

A high degree of purity of this material is essential to the formation of a satisfactory oxide film. After the forming of the film a sandwich is made of the separator with a foil on each side, and the whole is then rolled up. A strip at the end of each foil is cut and bent so as to project outside the roll to make terminal tags. The assembled condenser then goes through its various finishing processes and is finally assembled in a casing which may be cardboard or aluminium, usually the latter for motors, and sealed.

Satisfactory operation depends on the maintenance of the oxide film on the plates. When *in service* this film is maintained automatically by the electrolytic action of the leakage

current passing through the electrolyte. But when the condenser is allowed to stand idle, *i.e.*, off load, for any length of time deterioration of the film still takes place, with the important difference that in the absence of any current passing through it the deterioration is not made good by electrolytic action.

In the extreme case of the oxide film being completely decomposed, the condenser will not act as a condenser at all, but as a resistance, and the abnormally high current which will then pass will heat up the electrolyte and generally burn out the condenser. If, therefore, an electrolytic condenser is known to have been standing idle for any length of time (say, over six months) it should be "reformed" before being put back into service. This is done by disconnecting the condenser from the motor and connecting it to a source of d.c. of the same voltage as its working a.c. voltage, in series with two 40-W lamps and a milliammeter as shown in fig. 3.

At the instant of switching on, the current will attain to a comparatively high value, dependent on the degree of the deterioration of the film and the limiting effect of the lamp resistance. The passage of the current will deposit an oxide film on the plate and the current will gradually fall. A fully formed condenser will still show a slight leakage current, and forming may be taken as sufficient when its current falls to about 0.1 mA per μF of capacity, *i.e.*, 2.5 mA in the case of a 25 μF condenser.

After forming in one direction (during which one plate only is formed) the connection of the condenser to the supply must be reversed and the process repeated to form the other plate. This forming will take a few minutes to do, dependent on the construction of the condenser and the length of time it has been out of service. If the condenser refuses to respond to treatment, *i.e.*, the current remains high, deterioration of the electrolyte is indicated and the condenser should be discarded.

Another enemy of electrolytic condensers is excessive heat. This has the effect of drying up and otherwise deteriorating the electrolyte, with the result that it does not function properly and the life of the condenser is shortened. Condensers are usually mounted on motors so that they are practically surrounded by air and there is not much risk of the heat from the motor being transmitted to the condenser itself.

Motors should be, therefore, mounted in well ventilated situations, and if a capacitor motor is wanted for use under abnormal temperature conditions the manufacturers should be acquainted of this fact. Replacement condensers should be stored in a cool place, and should always be formed before being put into service.

Due to inherent characteristics, the heat loss when working on a.c. is greater in an electrolytic condenser than in one with paper or similar dielectric. Added to this, the bulk of a condenser for a given capacity is smaller, therefore, there is not so much surface area available for dissipating the heat produced.

Excessive internal heating will soon cause deterioration of the electrolyte and premature breakdown, as in the case of externally applied heat. As a result of these facts, electrolytic condensers are not suitable for uses where they are in *continuous* operation on a.c., but they are ideally suited for such applications as capacitor motors where the period of operation is extremely short.

Even in this case the frequency of operation is limited; it is quite usual to rate the condensers as being suitable for 20 or 30 starts per hour. Of course, under most conditions such frequency of starting is never wanted, but it is well to bear the fact in mind for cases of abnormal application may be encountered.

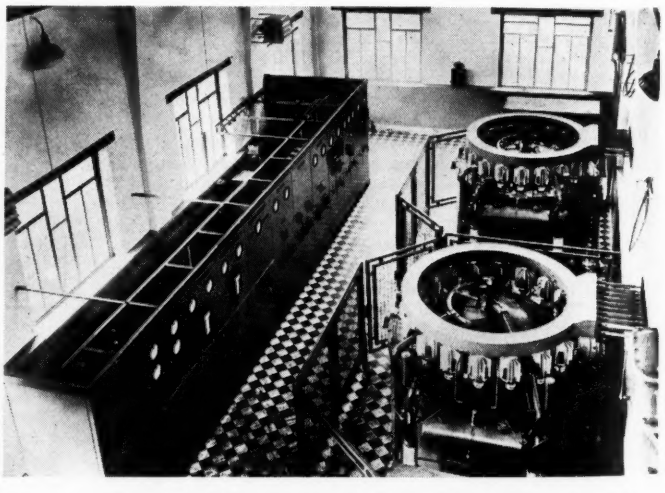
Electrolytic condensers can be designed for continuous working on a.c., but then their advantage of smaller size and lower cost is destroyed, and for such applications it is generally more economical to use the more common dielectric condenser, with the added advantage of an indefinite length of life.

Belgian Rolling Mill

Rectifier installation

THE controlled grid mercury rectifier installation for the operation of the rolling mill of the Société Métallurgique d'Esperance Longdoz, Belgium, is claimed to be the first of its kind anywhere. The mill was originally operated by steam engine, but the new installation has a 4,100 h.p. shunt-wound motor operating on 1,200 V d.c. with adjustment of the speed by variation in the voltage through grid control. The advantage of the system is that it permits large variations in speed. This is particularly important as the wear on the mill rolls is considerable, and the speed of their operation has to be reduced as this wear becomes more apparent. The rectifier is also 5 per cent. more efficient than a motor generator.

The rolls and flywheel are driven by the motor which is provided with a series winding and independent excitation. It is fed by rectifiers, the starting up and speed regulation being governed by varying the output voltage of the rectifier between 0 and 1,200 V. The rectifiers are fed through transformers from 10,000 V bus-bars, each transformer being provided with a section switch and a high-voltage cut-out. The d.c. sides of the rectifiers are connected to 1,200 V bus-bars through series reactances, control being by section switches and ultra rapid cut-outs. The last mentioned are operated by compressed air.



General view of the rectifiers at the Longdoz plant

The braking of the mill rolls is accomplished by connecting a resistance across the poles of the motor armature by the braking contactor. The motor speed can be regulated by varying the field of the exciter connected in series with part of the field rheostat. The direction of excitation can be reversed by a commutator which thus changes the direction of rotation of the motor and of the mill rolls.

The exciter is driven by a three-phase, squirrel-cage motor that also drives a constant voltage (110 V, 10 kW) generator which serves the auxiliary circuits, fed from a battery in case of need. The squirrel-cage motor is of 42 h.p. at 1,450 r.p.m., 500 V, 50 cycles, with star-delta starting and connected to the 500-V bus-bars which are normally fed from a 70-kVA, 10,000/500-V transformer. These bars also feed the motors for the cooling water circulation of the rectifiers and the motor for the compressor providing air for the cut-outs. Auxiliary current for the rectifiers is provided by a 15-kVA, 10,000/220-V transformer.

Speed regulation of the mill motor is by the rheostat which controls the grid circuits of the rectifiers. A second part of the same rheostat also increases the speed of the motor beyond the normal by inserting resistances in series in the field of the exciter. The push-buttons for the control of the mill motor are mounted on a desk in the motor shed, together with measuring instruments and lamps which indicate the position of apparatus in the rectifier station.

Pressing the button marked "start forward" on the control desk causes contactors and relays to operate automatically in the required sequence. To stop this motor it is only necessary to press the button marked "stop," which opens the cut-outs and brings the rheostat back to starting position.

Rapid stopping is obtained by pressing the brake control button which puts a resistance into the armature circuit of the motor to absorb the kinetic energy of the flywheel and mill rolls. Operation in reverse is also possible at low speeds by a special "start reverse" button which starts the motor and reverses the excitation.

Distributors in Rural Areas

By J. McCombe, Ph.D., A.M.I.E.E.

Low-voltage pole arrangements

The author aims at showing methods of low-voltage line construction which involve some measure of standardisation in order to reduce costs to the lowest level compatible with safety and satisfactory operation.

IN rural areas the suburbs of towns and villages consist principally of bungalows, villas, or semi-detached houses, and the electrical distributors are run on poles. In order to obtain consumers in scattered areas, the annual guarantee required must be reasonably low, and poles, fittings and practice must be standardised so that the work of construction can be carried out expeditiously and economically.

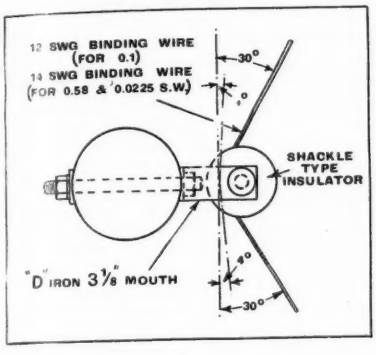


Fig. 1.—Plan view of l.v. pole suitable for angles of from 8 to 60 deg.

Low-voltage distributors generally consist of three-phase four-wire or single-phase two-wire lines. Where public lighting of highways is required a switch wire may be added. The distributor conductors are of 7/.136 (0.1 sq. in.) stranded hard-drawn copper with a neutral wire of the same material. In cases of lightly loaded feeders, 0.058 sq. in. stranded copper may be used for distributor wires.

In order to comply with the regulations, the following clearances between the ground and lowest wire must be observed for voltages not exceeding 650 d.c. or 325 a.c. :—Distributors: Across public roads, 19 ft.; other positions, 17 ft.; positions inaccessible to vehicles, 15 ft. Service lines: Across a carriageway, 19 ft.; along a carriage-way, 17 ft.

Poles of red fir supporting low-voltage lines have dimensions according to B.S.I. standards for medium and stout poles. At terminal and intermediate positions, medium poles are generally used, while the stout class is generally used at angle or junction positions. For double-circuit lines, it is customary to use stout poles at all positions. All drilling, slotting or scarfing of the poles should be carried out before creosoting. The top drilling is at 4 in. from the top of the pole and a 9 in. spacing is observed for the other holes. The holes are drilled ⅝ in. diameter clear. Where G.P.O. protection is necessary, an additional hole is drilled.

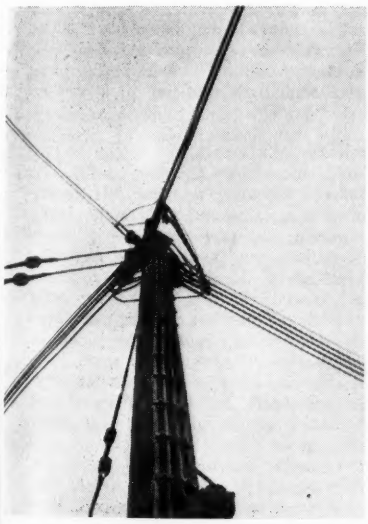


Fig. 2.—General arrangement of a three-way section pole

The details of the various types of poles used are as follows :—

(1) Terminal pole. Medium pole with two stays.

(2) Straight-line pole. For angles up to 8 deg.: 0-2 deg. medium pole, no stay; 2-5 deg. stout pole, no stay; 5-8 deg. medium pole, one stay.

(3) Angle pole. Suitable for angles of 8 to 60 deg.: 8 to 20 deg. stout pole, one stay; 20 to 60 deg. stout pole, two stays. The general arrangement is shown in fig. 1.

(4) Angle pole. For angles of 60 deg. to 90 deg., a stout pole with two stays is used; a knuckle boss is fitted on the pole spindle to enable the two sets of wires to be taken off the same side of pole.

(5) Three-way pole. Stout pole with stays as required. On one side of the pole the arrangement is similar to a straight line pole, while the tee-off is effected with "D" irons.

(6) Three-way section pole. Stout pole with stays as required. A view of the general arrangement is shown in fig. 2. A knuckle boss with shackle straps is employed on one side of of the pole while "D" irons carried on the opposite end of the spindle complete the arrangement for the other side of the pole.

(7) Four-way section pole. Stout pole with stays as required and two knuckle bosses. Fig. 3 illustrates the method of sectionalising four l.v. lines on one pole. In exceptional cases a five-way section pole can be made by using a longer bolt

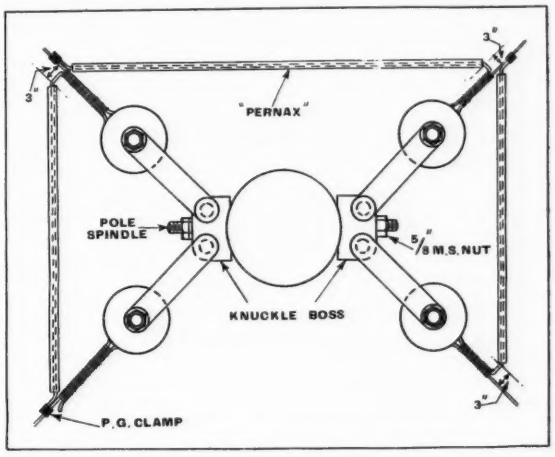


Fig. 3.—L.v. four-way pole

on one side of one of the knuckle bosses so that two sets of shackle straps can be accommodated. Thus three lines come off one knuckle boss and two off the other.

The conductor should be bound on the insulator so that the insulator and not the binder takes the pull due to the conductors. With 0.1 sq. in. conductors, a No. 12 s.w.g. soft copper binder is employed, while with 0.058 sq. in. the binder is No. 14 s.w.g. The method of binding conductors to insulators, on pole types 1, 4, 5 (shackle side), 6 and 7 is shown in fig. 4 (top) and types 2, 3 and 5 (line side) are bound as fig. 4 (bottom).

Low-voltage poles must be properly stayed or strutted at angle or terminal positions. A stay insulator is usually employed about 5 ft. from the pole. Details of such an arrangement are shown in fig. 5.

The direct staying of poles is not always practicable due

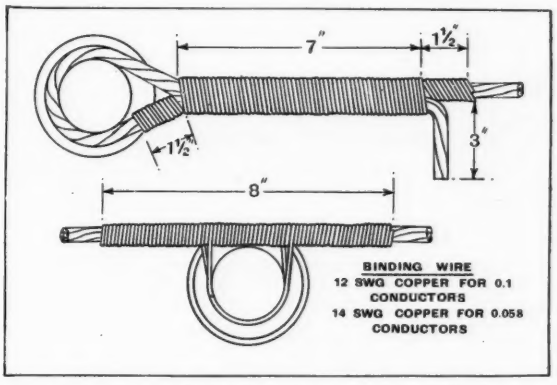


Fig. 4.—Methods of binding: Top, for terminal, angle, three-way (shackle side), three-way section and four-way poles. Bottom, for straight-line, angle (8 to 60 deg.), and three-way (line side) poles

to proximity of roads and telephone wires, when a jockey pole is employed. The arrangement of this is similar to fig. 5. Overhead stay wires are made off connecting the jockey pole with the pole to be stayed. Where it is impossible to get stay

Electrical Progress in Germany

Wide range covered at the V.D.E. meeting

THE proceedings of the recent general meeting of the Association of German Electrical Engineers (V.D.E.), at Cologne, opened with an address on the ethics of engineering by Herr E. Maier, Director of Education of German Technology. This address was largely directed towards the young engineers whose participation in the V.D.E. is promoted by *Jungingenieur-Arbeitsgemeinschaften*, corresponding broadly to the Students' Section of the I.E.E. In the electrical field, as in all other branches of German industry under the new regime, the rising generation is taught that technical proficiency is only a part, though an essential one, of the service that it must give to the economic and sociological welfare of the nation.

The subsequent sessions were devoted to groups of papers, usually at least four in each group, and about sixty in all, reviewing progress and indicating current problems in electrical transmission, machinery and transformers, measurements, communications, heavy-current cables, industrial drives, testing and control, switchgear, heating apparatus and the use of new or substitute materials in various branches of electrical manufacture.

Compared with the year 1929, the generation of electricity in Germany has increased by about 77 per cent., and the papers dealing with transmission and distribution were mainly concerned with means of making the greatest use of existing networks and with the possibilities of applying new principles in distribution to meet the rising consumption. Increased technical utilisation of given quantities of materials was also the keynote of the papers on electrical machinery. Reduced windage losses, new windings, and higher running speeds are among the developments that have contributed to savings in iron and copper. Developments in transformers include further improvements in plates and insulation, the treatment of oil *in vacuo*, and the more extensive use of dry transformers as a means of reducing oil requirements and decreasing fire risks.

Distributors in Rural Areas

(Continued from previous page)

positions, a wooden strut is employed. In the fitting of such a strut special attention should be paid to the fitting of the oak key.

The basic span length for low-voltage 0.1 sq. in. conductors is 150 ft. with a sag value of approx. 3 ft. 6 in. at 122 deg. F.

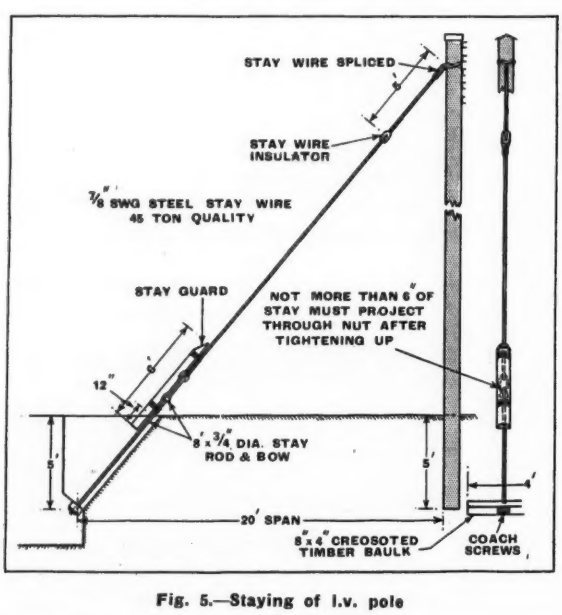

STAY WIRE SPLICED
STAY WIRE INSULATOR
⅜" SWG STEEL STAY WIRE 45 TON QUALITY
STAY GUARD
NOT MORE THAN 6" OF STAY MUST PROJECT THROUGH NUT AFTER TIGHTENING UP
12"
8' x ¾" DIA. STAY ROD & BOW
5'
5'
20' SPAN
8"x4" CREOSOTED TIMBER BAULK
COACH SCREWS

Fig. 5.—Staying of l.v. pole

A sag tension chart is usually prepared, giving the sags and tensions for the various span lengths at different temperatures. It is customary to erect 0.1 sq. in. conductors at a higher factor of safety than is specified in the regulations. This enables the lighter switch wire, guard wire, etc., to be sagged parallel to the heavier 0.1 sq. in. conductors and still maintain the necessary factor of safety. Spans in low-voltage practice may be employed up to 180 ft. but this should be the maximum value.

The ever-increasing importance and capabilities of electrical instruments and measurements were indicated by the eight papers in this group. The subjects dealt with included cathode-ray oscillographs, condenser-type apparatus for the measurements of a fraction of high voltages, high-frequency measurements of the magnetic susceptibilities of various substances, ink-recorders capable of measuring 10^{-6} volt and accurate within 0.001 per cent., and the "storage" of an electric charge in porcelain cooled from high temperatures, the charge being incapable of detection until the porcelain is again heated. The non-destructive testing of ceramic insulators in course of manufacture improves and cheapens production.

Television Transmission Cable

Interesting announcements were made concerning a "filament cable" in which the conductor is suspended axially for television and similar high-frequency transmissions. Besides papers of specialised scope in communication engineering, there was one comparing various methods at present in use for electrical communication by wire and showing that, within the same band of frequencies, the traffic capacity of the printing telegraph is far greater than that of the telephone. The V.D.E. rules relating to the permissible loading of power cables are based on temperature limits, the observance of which is facilitated by automatic overload-protection gear actuated by thermal devices. Other developments in this field include the supplementary heating of lightly loaded cables to avoid temperature variations injurious to the insulation, and the use of micro-sections in the examination of insulation. Operating experience with new porcelain cables is regarded as an important contribution to the Four Year Plan of national self-sufficiency in raw materials.

Among the papers in the industrial drive section there was a valuable communication on the selection of switch and control gear with special reference to the nature and frequency of the duty-cycle concerned; particulars of safety provisions which permit the drive of heavy rollers for raw rubber to be stopped in one second and reversed to release trapped fingers; and a description of a new photo-electric control for profile milling machines in which the usual copying mechanism is replaced by the photo-electric following of a series of two-dimensional sectional drawings. Applications of photo-electric devices to industrial control and protection formed the subject of another paper. Valuable information applicable to the further development of explosion-proof switchgear has resulted from determinations of the explosion pressure of petrol-air mixtures; and the protection of gear against damage by lightning is assisted by the results of tests with artificial discharges up to 300,000 A.

Synthetic Materials

One of the most noticeable features in the field of domestic cookers, water heaters and other heating appliances is the extensive use now made of German raw materials without any considerable changes in design and performance. Of even wider interest are the attention devoted to the use of synthetic products, and the timely efforts to develop and secure international adoption of a rational classification of synthetic materials. Lack of agreement on this point and the use of distinctive but uninformative proprietary names by different manufacturers of synthetic materials have caused much confusion and probably restricted the use of such products. Extensive trials by the German State Railways of wires and cables with synthetic insulation are indicative of important developments in this direction.

The closing session of the meeting was marked by the nomination as honorary members of the V.D.E. of Professor Dr. Waldemar Petersen for his work on the Petersen coil, Professor Dr. Walter Rogowski for his researches with the cathode-ray oscillograph and Herr Ernst Conrad Zehme for his pioneering work in the field of electric traction. The rules of the V.D.E. have been linked with the legislation of the Reich by the provisions of the *Energiewirtschaftsgesetz* (Power Development Law); and, as indicating the national importance of the work within the purview of the Association, it is mentioned that about three-fourths of the 50,000 million kWh generated in Germany last year was consumed by electric motors.

The industrial consumption of electricity will, moreover, be greatly increased as the realisation of the Four Year Plan proceeds. Up to 7,000 kWh is required per ton of finished synthetic textile manufactures, and the consumption of electrical energy in the manufacture and processing of petrol, rubber and other materials is rapidly increasing. The ultimate limits of development cannot be foreseen.

Organising Cable Contracts

By J. L. G.

How to save time and labour

SUCCESS in organising an outside contract lies for a greater part in the preliminaries at the head office. A day or two, even a whole week, devoted to making oneself thoroughly familiar with the terms of the contract by consulting each department concerned will avoid an enormous amount of correspondence later on.

This initial work is based on a preliminary survey made by the engineer in company with the representative of the customers, during which he has marked an Ordnance sheet with the fullest particulars of the individual lengths of cable between joints together with the class of soil to be excavated in each length. For this information a little trouble to discover men who have been regularly employed in such work is worth more than any other local particular. The surveyor will supply details of the main services underground which will certainly be encountered and will cause either a diversion of the cable route or a length of extra deep excavation. The crossing of busy roads is frequently affected by main drains and sewers. The temptation is to make a casual note of these facts and when excavation is in progress deep working with "shuttering" may be found necessary at an inflated cost in man-hours.

In built-up areas it will be safe to assume a water, gas and sewerage connection to each house, but there again only the surveyor can inform one where and how many pipe lines emerge from the various groups of houses. The cable may have to be dipped below a dozen such drains in a hundred yards, or perhaps only two. Getting under a house service drain means extra laying costs, which are better anticipated than suddenly encountered.

A preliminary survey of the ground, drawing upon local knowledge, will disclose possible causes of delay. This, together with advance co-operation with the parties concerned, will enable a schedule to be planned and adhered to

The surfaces of roads and paths are all-important at this preliminary stage, but the estimating department should have had this information in detail prior to the submission of a tender. The engineer's job will be to see those surfaces reinstated in such a manner as to avoid extra expense in repeated attention with punners and rollers before permanent reinstatement. A record of the exact length of each class of surface will prevent claims for permanent reinstatement in fine tar-mac gravel where it was not used previously.

The position of joints should be marked and numbered in sequence, the drum lengths to correspond. Excavations over river and railway bridges or across railway tracks entail attention to the requirements of the authorities concerned. Separate detail sketches should be obtained with a view to submitting scale drawings for approval to them. The customer's clerk-of-works may be responsible for this information in the first instance, but it should be carefully checked to obviate expensive delays when laying is in progress.

It is advisable to ascertain whether the sites of sub-stations are purchased and conveyance completed, because access to the sites over adjoining property may not be cleared when the building of the kiosks or the preparation of the site for an outdoor installation are due to begin, with consequent effect upon the progress schedule. Frequently purchases of small plots for sub-stations involve delays quite unanticipated by the customer during preliminary arrangements. The engineer may be compelled to hold up work at such points when with normal progress the buildings or foundations could have been going forward at the same time as the laying of the cables. Access over property must be decided upon at an early stage; otherwise, weeks may be added to the period of the contract for which extra payment cannot easily be obtained.

Dealings with Highway Authorities

The roads and streets for which each urban, rural and county council is responsible should be recorded, since the engineer will have the duty of issuing short notices to them prior to work commencing. The same information should be gleaned when canals and railways are involved. It is of great assistance to be actually known to the officials responsible, as one may require their co-operation at short notice; moreover, any damage sustained as the result of cable laying is better dealt with when they are aware of operations in progress over their property.

Particulars of local labour rates and transport need to be ascertained. Contact with the local railway officials may often be an advantage in the subsequent handling of materials. Transport may be a large item of expenditure in the event of much surplus soil being moved and clay or sand brought from a distance for rocky trenches or bad soil. Hence a preliminary inquiry as to persons willing to do haulage at odd times with their rate per hour or day is time better spent before than after the job commences.

Access having been arranged to sub-station sites, pits or other brick structures, a local builder, who will need to be employed as sub-contractor, should be approached during preliminaries in order to determine whether he can make a definite start on the buildings at the date most convenient to the engineer. Any delays which may otherwise be experienced are at the cost of the contract, the true basis of which is *man-hours*.

Visualising the work ahead in as great a detail as possible, which is essential to the smooth running of the contract, can be done on the site only. Afterwards, at the head office, the engineer can tabulate the information given by his map and notes whilst the whole lay-out of the district is fresh in his mind. There is ample material available for drawing up elaborate charts, but the essential outcome is an intimate knowledge of each cable length, sub-station, drawing-in pit or joint position.

The engineer should go through a schedule of the cable lengths with the works manager. Thus, if standard lengths on drums are to be used, the previously determined positions of joints or drawing-in pits may have to be altered. He should discuss with him the design of joints and of special fittings and other non-standard material and determine the numbering of drums and delivery in sequence or otherwise with, if possible, dates of delivery. The programme for the jointers is an important matter and the jointing material should not precede the men by weeks since that means stores on site for avoidable periods.

Having dealt with the cable section, the engineer should proceed on the same lines with the switchgear section, where, again, the delivery dates may be ascertained and delivery—finally decided on site by the progress with sub-stations—will not be a subject of endless correspondence.

At this stage the engineer should be able to frame a schedule; *e.g.*, Drum No. 1, length 200 yd. sub-station No. 1, soil; Drum No. 2, length 300 yd. High St., part rock; Drum No. 3, length 150 yd. railway bridge, rock; and thus from sub-station to sub-station. Another schedule is required for joints, giving positions, thus: Joint 1, in soil, No. 21, High St.; Joint 2, brick pit, corner of High St. and Lilac Avenue; Joint 3, brick pit, No. 2 Bridge St. If low- and high-voltage cables are being handled at the same time the schedules will include any tee-off points or looping-in arrangements, and in general will provide a programme of progress to be anticipated in view of knowledge of the soil, obstructions and special conditions to be dealt with.

Method of Procedure

The sequence of operations will in general follow a programme somewhat as follows: Excavation and laying, brick pits built, sub-station sites prepared, kiosks built, joints completed, switchgear installed and connected, low-voltage pillars fixed and connected. The first four operations are more economically carried out the closer they coincide. Brick pits may be built when laying has advanced two lengths of cable.

Work on the sub-stations would not be begun before the engineer is on site and laying has commenced, as otherwise he would have to be there before other materials came to hand and the dovetailing of operations would not be achieved. The other three items are so closely intertwined with the jointer's activities that simultaneous operations here are a decided economy. They follow at a date dependent upon completion of the sub-stations and brick pits.

With these schedules prepared, the engineer would be able to insert against the appropriate items any anticipated delays, enabling him to avoid serious loss of man-hours. For example, the cost of delay of a gang of 100 men for one hour only is £5, for half-a-day £20, and for one day £45. With jointers and mates who have arrived on the job and cannot proceed with their work delay may cost £2 per day. To each item must be added the extra time loss reflected back on to the numerous departments occupied with the contract.

The next preliminary is the selection of plant and tools. The engineer should draw up a list based on the results of his survey. With this he should obtain particulars of what items will be available in good time from other jobs.

A talk with the accountant who will deal with his reports

and completed work schedules will go a long way to smooth working. Many points crop up in schedules which necessitate a common knowledge and a method of expression used for certain items may not be clearly appreciated by both. An understanding with the drawing office, after a careful examination of the drawings issued or pending issue, will enable him to deal with switchgear, transformers, etc., without further reference by correspondence, especially if new designs are to be installed or special installation details provided for in the foundations. The estimating department has already done its work on the contract, and will be greatly interested in the engineer's views after the job has been done. He has no need to look in upon them.

The preliminaries conclude with making definite arrangements with the cashier regarding the weekly pay roll. The simplest pay-cash arrangement is that whereby the local bank cashes a cheque, forwarded from the head office, in favour of the engineer, who makes up the pay-packets, purchases the health and unemployment stamps, stamps the cards, pays local small accounts and haulage, and returns a cash account to the head office. Weekly balances are carried forward. In other systems all health and unemployment cards are retained and stamped at the head office, whence pay-packets are forwarded already made up for each week. This leads to correspondence, delays, lost cards and other strictly office troubles, which take up the impatient engineer's time.

The engineer will be ready to proceed to site upon being notified of the despatch of the plant and tools and the initial consignment of cable. The number of men engaged should bear a strict relationship to the possible length of any particular class of soil that can be reasonably dealt with in the day. The first five lengths are perhaps scheduled as being in rock or involve a number of road-crossings and duct-laying. It may pay to engage twenty men only for the first week because of these factors. Later on a long stretch of soil excavation may warrant one hundred men being employed. A foreman's attention should be as concentrated as possible, as men in half-a-dozen streets at once are prone to "dodge the column." If it is essential to work at different places simultaneously, the engagement of other foremen or charge-hands is advisable.

The engineer must see that adequate equipment is available for each gang according to the day's work anticipated. He must keep in touch with the customer's engineer and promptly deal with any modifications brought about by unexpected obstructions or unforeseen objections of property-owners or councils with whom the customer's engineer will require to negotiate. Any delay occasioned should be recorded promptly, so that written evidence exists to justify expenditure in excess of the amount allowed. The engineer should make his supervision of the men general rather than detail; the latter is the responsibility of the foreman.

Records of progress are preferably marked on a large scale map enlargement from Ordnance sheets; a scale of 1 in. = 20 ft. gives legible readings with details of obstructions revealed by excavations. These particulars should be entered each day thus combining a daily progress and a permanent record which is infinitely superior to a progress sheet.

It will be the engineer's duty to see that everything is cleared well ahead of the gangs. An approach to a railway underground crossing will necessitate agreeing times and methods with the officials of the railway so that the actual operations coincide the most conveniently with the advance of the cable laying. He will also be well occupied in seeing that the sub-stations and brick-pits are progressing satisfactorily coincident with the other operations.

All local accounts should be cleared each week unless the supplier has arranged a ledger account with the head office, in which case certification of the weekly amounts should be forwarded to them.

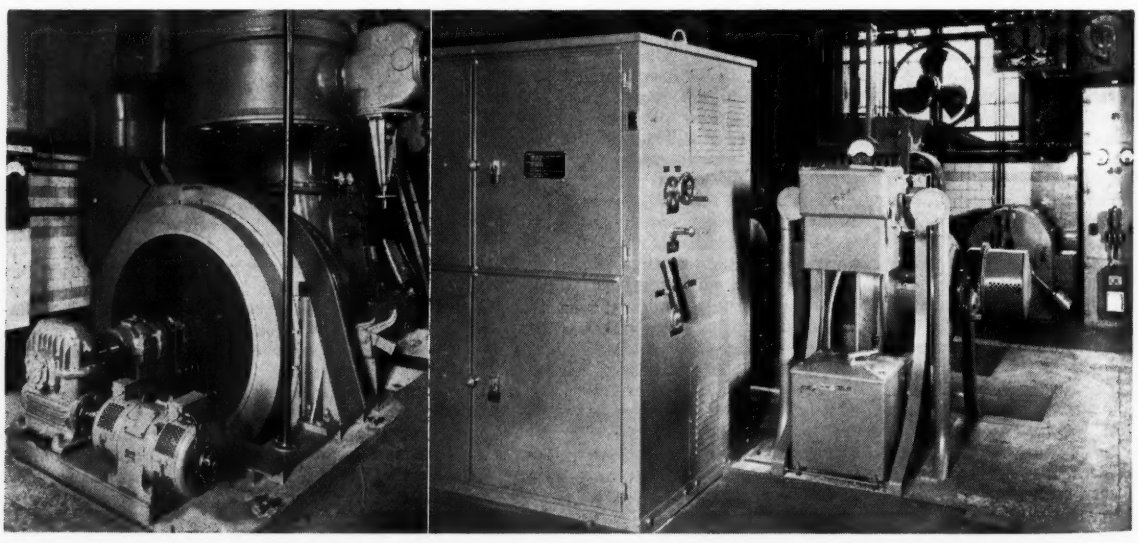
Scherbius Compressor Control

Economy through variable speed

THERE has recently been installed in the B.T.H. works power house at Rugby a 3,000 cu. ft. air compressor with Scherbius control, which is claimed to be the first of its kind. The air supply is controlled automatically to suit the demand by varying the speed of the compressor, thus improving the overall efficiency and reducing wear and tear.

The driving motor is of the slip-ring induction type and its speed is varied by means of a Scherbius regulating machine. The motor is rated at 615/307 h.p. at 250/125 r.p.m., and is supplied at 440 V, 50 cycles, 3-phase. The Scherbius machine, which is rated at 190 V, 150 kVA, is shunt excited from a tapped transformer, in conjunction with a small a.c. exciter which is gear driven from the main motor. Control of the speed is obtained by means of a faceplate tapping switch that changes the transformer taps and thus varies the excitation of the Scherbius machine. The speed control switch is operated by a Hopkinson Carlstedt pressure regulator, which raises the speed if the pressure drops, and *vice versa*, thus maintaining approximately constant pressure during all changes of load. If the quantity of air required is less than half the maximum, the motor runs at its lowest speed and the unloading valve comes into operation, but the losses due to unloading are then less than with a constant-speed drive because of the reduced speed.

Compared with a constant-speed drive, an appreciable saving in power is obtained by running the compressor at variable speed, first because the unloaded condition at top speed is avoided and, secondly, because the efficiency of the compressor is improved at reduced speeds, due to the lower temperature at which it works. In addition, maintenance is easier, because the speed and temperature are reduced for most of the time the set is in operation.



Left: Induction motor and compressor with gear-driven exciter at the B.T.H. power house at Rugby. Right: The control apparatus

The left-hand illustration shows the induction motor and compressor with the gear-driven exciter, and that on the right the control apparatus, consisting of the speed control cubicle which contains the tapped transformer and faceplate switch, the regulating set behind the cubicle, and the starting gear for the motor driving the Scherbius machine. The main switch and the starter for the main induction motor can be seen behind on the right.

What is a Kilowatt of Maximum Demand?

By G. W. Stubbings, B.Sc., A.M.I.E.E.

NOT the least important of the principles which should govern tariff design is that which stipulates the necessity for exact definition of the measured physical quantities upon which a consumer's bill is based. It is true that the fundamental basis for the measurement of electricity supply is, for reasons of expediency, not quite definite, from the point of view of physical significance. A kWh of a.c. supply is a definite amount of energy, related to the fundamental c.g.s. system of units, which can be measured with a high degree of commercial accuracy. When the supply is d.c. the unit of measurement is physically quite different; a d.c. unit may be, and often is, based upon quantity. From a practical point of view this distinction is of little importance as it has been proved by experiment that the measures of a consumer's supply in d.c. units, based inherently on quantity, and in true kWh, are very nearly equal.

When the two-part tariff for power supplied, based upon kWh and kW of maximum demand, is considered, a totally different state of affairs is found. The kWh is an exact physical quantity, so, from a purely theoretical point of view, is the kW. The kW of maximum demand upon which a large part of a power consumer's bill is based is, however, a very indefinite kind of quantity. The measure of a demand peak is always some kind of average, and the actual value of a peak load upon which the consumer's bill is calculated depends upon purely arbitrary considerations of method of measurement and the time factor in averaging.

Causes of Ambiguity

This lack of exact definition of a physical quantity of fundamental importance in electricity supply is well known to metering engineers. In effect, the ambiguity of definition means that, within limits, a supply engineer is at liberty to assign his own meaning to the term "kW of maximum demand." That an anomaly so serious has persisted so long seems to show that it has never been adequately considered by the electricity supply industry.

The first cause of ambiguity in the physical meaning of the kW of m.d. arises from the lack of authoritative standardisation of the averaging period. The effect of variation of the averaging period is easily illustrated. Consider a peak demand of constant value of 100 kW lasting for ten minutes. Under the Merz system of maximum demand measurement, the averaging times are successive clock intervals. If the averaging time is 30 minutes, and the peak demand falls entirely within one of the clock intervals, the recorded value will be 33.3 kW. If the averaging time is 20 minutes, then, subject to the same condition, the recorded value will be 50 kW. If, on the other hand, the period of the peak demand falls within two clock intervals, the recorded value will be less, its minimum value being given when the conclusion of an averaging period exactly divides the period during which the peak demand persists.

Thus, considering the averaging time as practically variable between the limits of 20 and 30 minutes, the recorded value of a steady ten-minute peak of 100 kW can vary between the limits of 17 and 50 kW. Under the alternative method of measuring peak demand by means of an instrument with a thermal lag, the ambiguity arising from the relation of the actual time of incidence of the peak and the averaging intervals does not arise, because a thermal indicator does not, like the Merz indicator, make use of clock intervals. This, however, is not the only difference between the two methods of demand measurement. There is a further difference of a still more important character.

Differences in Demand Indicators

With a Merz type of indicator, a steady load gives rise to an advance of the indicator mechanism of constant speed. With a thermal indicator, the advance with a steady load is exponential with respect to time. The effect of this difference is by no means trifling. Disregarding the clock time of incidence, the registration of short peaks under the Merz system is inversely proportional to the time of their incidence; that is to say, a peak of 100 kW for five minutes will be registered at one-half the value of another of the same magnitude for ten minutes. Because of the circumstance that the rate of advance of the pointer of a thermal indicator is greater at the beginning than at the end of a constant peak, the registration of a maximum demand of five minutes will be more than half as great as that of a demand of the same value lasting ten minutes. The practical effect of all this is that if two demand indicators, one of the Merz and the other of the thermal type, are installed in series to measure a consumer's maximum demand the registrations, apart altogether from considerations of tested accuracy and averaging periods, will not necessarily be the same.

The present trend towards the exact specification of metering consumers' supplies, indicated by the circumstance that so approximate an instrument as the two-element, three-phase, four-wire meter will no longer be manufactured, cannot but result in standardisation of the method of measuring maximum demand. Some of the ambiguities now existing were pointed out over three years ago by a committee appointed by the Federation of British Industries, and the term "kW of maximum demand" is in urgent need of exact definition by authoritative specification of the manner in which it is to be measured. It seems certain that the two types of instruments, now apparently used indifferently, cannot be considered as permissible alternatives. Their respective spheres of application need to be definitely specified.

It is not a matter of the respective accuracies of the two methods; maximum demand as a basis for charging must be some sort of average, and its measurement must be based on some sort of convention. What precisely this convention is does not matter very much, as long as it is defined. As it would seem impracticable to stipulate that a Merz type of indicator must be used in all circumstances, the respective spheres of utilisation of the two types of instruments might be settled upon a basis of kW rating. This, of course, would mean that on the two sides of the limiting rating of a thermal indicator a kW of maximum demand would have differing meanings. This anomaly would, however, be very much less serious, particularly if averaging periods were standardised, than under the present position whereby the meaning of a kW of maximum demand is subject to no kind of regulation whatsoever, and is dependent upon purely individual caprice.

The B.A. Meeting at Cambridge

A NUMBER of papers of electrical and allied interest will be presented at the Cambridge meeting of the British Association for the Advancement of Science which opens next week (August 17th to 24th). The president of the Engineering Section (G) will cover a wide field in his address on "The Changing Outlook of Engineering Science" to be delivered on Thursday morning. An innovation for the Section is a series of short papers by junior engineers among which we note the following.—"Transients in Transformers" (oscillograph demonstration), by Mr. F. B. Greatex; "Suppression of Radio Interference Caused by Trolley-buses," by Mr. J E. M. Coombes; and "A Moving Coil Vibrometer," by Mr. G. C. Eccles. The proceedings will also include papers by Mr. R. W. Allen, C.B.E., on "Some Experiences of the Use of Scale Models in General Engineering"; by Prof. W. Cramp, Mr. C. E. Webb, Mr. D. C. Gall, Dr. L. G. A. Sims and Mr. J. Spinks, Mr. J. Grieg and Mr. J. E. Parton, and Mr. E. V. D. Glazier and Mr. J. E. Parton as contributors to a symposium (held jointly with the Mathematics and Physics Section) on "Magnetic Measurement with Special Reference to Incremental Conditions." There will also be a symposium on "Vibration" on August 23rd. The works to be visited include those of Pye Radio, Ltd., and Kryn and Lahy.

The cyclotron, which was described in our July 8th issue, by Dr. T. F. Wall is a part of the equipment for nuclear research at the Cavendish Laboratory, Cambridge, which is to be dealt with by Dr. J. D. Cockcroft in the Mathematics and Physics Section (A) as part of a symposium on "Nuclear Physics." Papers on "Magnetic Alloys and X-ray Structure" will be presented on August 19th by Professor W. L. Bragg, Dr. E. C. Stoner, Dr. A. J. Bradley, Dr. W. Sucksmith and Mr. D. A. Oliver. Members of the Section are to visit the Cambridge Instrument Co.'s works on August 19th.

One or two papers in other sections will contain matter of interest to electrical people. For instance, in Section L—Educational Science—the design of schools is to be discussed and attention will be paid to heating, ventilation and lighting.

High-voltage Course for Teachers

A special course in high-voltage engineering for teachers in technical schools will be held, in association with the Board of Education, at Queen Mary College, University of London, from September 5th to 16th. High-voltage electricity has sprung into importance since most teachers received their training. They should find this ten days' course valuable and enjoyable, for they will have the use of the equipment in the laboratory—claimed to be the best of its kind in any university in Great Britain—and attend lectures given by experts in every branch of the subject.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Salaries and the Distribution Bill

I have read the leading article under the above heading in your issue of July 29th, and think that this matter should not be allowed to go without question. I refer in particular to the last two paragraphs in which it is stated that the employers were opposed to any immediate action because the new proposed legislation would probably cause radical changes, and you end by stating "it provides yet another reason for the Government to make some move or definite statement."

As the subject under discussion is power station staffs' salaries and the proposed legislation relates to distribution only, either there is some misunderstanding by you of what actually took place, or something is radically wrong. It is not justifiable to use any deadlock on the subject of power station staffs' salaries as a lever to urge the Government to introduce a Distribution Bill. W. FENNELL,

General Manager and Engineer,
Mid-Cheshire Electricity Supply Co., Ltd.

Northwich, *August 5th.*

[The contention of the employers' side of the National Joint Board (as reported in the July *Electrical Power Engineer*) was too clear to be misunderstood. Mr. Fennell misjudges us when he says that we used the subject of salaries as a lever to urge the Government to introduce *a* Distribution Bill. All we did was to point out that this was yet another reason for doing something definite about *the* Distribution Bill which it is the Government's often-expresed intention to introduce. —EDS., ELEC. REV.]

The Cleaning of Mercury

With reference to the article which appeared in the ELECTRICAL REVIEW of July 22nd on the cleaning of mercury, it will probably be of interest to yourselves and your readers that this company has, for some years, marketed a mercury distillation apparatus employing similar principles to those mentioned by Mr. J. L. Ferns. We have also recently incorporated certain improvements in our distillation apparatus and are now marketing a new series as described in our Bulletin No. 5.

This still has the advantage that it is completely automatic and may safely be left running night and day since the feed provides a constant level in the boiler. The reservoir contains sufficient mercury for a complete day's run of 24 hours and may be refilled without interrupting distillation. The still is marketed in two sizes producing about ½ lb. and 1 lb. respectively of redistilled mercury per hour.

The same bulletin describes also a filtering apparatus which has a most efficient means of removing scum, dirt and moisture from mercury. This consists of a porous pot perforated with fine holes in the bottom and resting in a hopper which directs the flow of mercury into the receiver. This device avoids any necessity for heating the mercury in an open vessel, which is, as pointed out by Mr. T. A. Evans in the ELECTRICAL REVIEW of July 29th, a most dangerous operation.

This equipment is already in use at the works of a number of electricity undertakings and we have received expressions of complete satisfaction. BAIRD & TATLOCK (LONDON), LTD.

London, E.C.1, *August 3rd.* H. H. BAIRD, *Director.*

Plugs and Sockets

I recently purchased an electric fire at one of the large London stores and was warned that it was too big to connect up to a lampholder. Upon asking how I was to connect it to a floor outlet when there was nothing on the end of the wires I was told that my local electrical man would fit the proper plug. I further inquired why they (the sellers) could not fit one, and it was explained that plugs varied so much that it was an even chance that the plug supplied would not fit the sockets in my house.

I then suggested that perhaps if I brought a plug along to the store they would fit it for me; but this apparently was not considered a part of their duty to their customers.

Consequently, knowing nothing about electrical engineering and wishing to be on the safe side, I have had to call in an electrical engineer whose bill will be added to the cost of the fire. Is this the way to encourage the sale of electrical appliances? IGNORAMUS.

August 9th, 1938.

Accidents in Industry

Chief Inspector's report for 1937

THE Chief Inspector of Factories and Workshops, Sir Duncan R. Wilson, commences his annual report for the year 1937 (Cmd. 5802, H.M. Stationery Office, 2s.) with the observation that the new requirements of the Factory Act, 1937, which came into force last month, will involve a big expansion in executive action with consequent additions to the inspectorate staff, which will eventually total 332. There are eleven electrical inspectors at present.

During the year under review 276,114 premises were subject to inspection. There were 169,277 factories, an increase of 2,411; and 71,106 workshops, a decrease of 4,047. The number of electricity "works" subject to the regulations was 148,740. There was a notable increase, though not so great as in 1936, in the number of accidents reported, namely, 192,539, of which 1,003 were fatal. The increase of approximately 9 per cent. is attributed in the main to greater industrial activity. This so increased the demand for electricity as to cause the enlargement of several generating stations. In the pottery industry three additional electric kilns were completed in the Stoke area, bringing the total up to about twenty.

The building trade was most active last year. A matter of some concern to the inspectors is the use on buildings of portable electrically driven machines, which are not earthed at all, or only imperfectly so. The risk of shock is said to be high, and legal proceedings were taken in several instances. One contractor had to be prosecuted three times before he took action!

There was a large number of fires, one of which completely destroyed an electricity generating station supplying a small town; it was caused by a fuel-oil tank overflowing on to the hot exhaust pipes of the engine. The fire risk has been increased by the growing use of cellulose solutions, and in one case ignition in a duct was caused by friction from the blades of a fan. Static sparks appeared to cause a number of fires where inflammable liquids were used, particularly for the cleaning of artificial silk garments. Several explosions were due to the breaking of unsuitable inspection lamps inside vessels containing inflammable liquids.

In 1937 there were 583 electrical accidents, 31 fatal, the majority of the 12 per cent. increase being among workers who were electrically unskilled. There were 30 prosecutions, 18 for contraventions of regulations, and convictions were obtained in all but one case.

There have been further disturbing cases of electrical failures followed by fires in bus-bar zones. The lack of automatic protection in this part of an installation affords ground for considering the terms of Regulation 8, which requires measures to be taken for the prevention of danger from excess current. While the report admits the importance of maintaining continuity of supply, it contends that commercial considerations have been allowed to outweigh the legal obligation.

Special attention is directed to a new source of risk, which the report states is tending to become serious: the capacity of switchgear installed by large consumers is in some instances becoming insufficient to deal with faults that may occur. The consequential risk of explosions followed by serious fires is increased. The situation is somewhat disturbing and the report declares that some action on preconcerted lines will have to be considered.

Fatalities resulting from cable and flexible lead accidents were in excess of those for recent years, but a reduction is recorded of the number of accidents due to portable apparatus attached to flexible cables. There were 93 "dangerous occurrences," mostly due to failures of electrical plant followed by fire; apart from which several fires were attributed to faulty wiring and inadequate earthing.

There were ten cases (one fatal) of lead poisoning, a decrease of five, in works dealing with electric accumulators, the manufacture of which is again being taken up by persons not fully alive to the risks. The number of electric accumulator works subject to the regulations was 272 in 1937. Accidents due to electrical causes in connection with cranes and winches numbered five only.

The report mentions the general, if gradual, improvement still to be observed with regard to factory lighting in all parts of the country. Reference is made to the requirements of Sec. 5 of the new Factory Act in this respect, and examples are quoted of modern systems of illumination voluntarily installed to replace antiquated ones.

New Electric Washing Machines

Details of models recently introduced

DURING the past few months several new washing machines have been introduced in this country, some being imported from America and others being manufactured over here. One of the most interesting of the latter is a machine made by COTTO PRODUCTS, Enterprise Works, Scunthorpe, Lincs. It has a square type of body fitted with a porcelain enamelled table top. When in use the top is removed, leaving a well which prevents water dripping on to the floor. The electrically operated wringer is attached to the top, and is fitted with an instantaneous safety release in addition to the normal "on"-"off" switch.

The agitator, which is of the four-vane type of inverted "V" section, is manually operated. Moving the handle on the top of the washer causes the paddle to revolve and at the same time rise and fall, thus setting up a vacuum ensuring a double washing action.

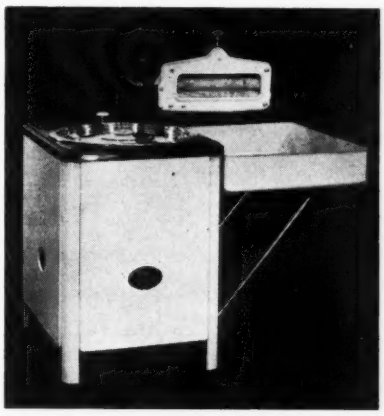
The tub is of heavy gauge stainless steel and is completely free from protruding parts having a completely clear tub. Heating is by means of electric elements which, it is stated, will raise the temperature of the water to 140 deg. in an hour. Three heats are provided.

New principles of washing-machine construction are embodied in the "Bar-Spot" washing machine of BARKER & TURNER, LTD., Grena Works, Townshend Terrace, Richmond, Surrey. The agitator is fixed to the bottom of the tank, which is oscillated electrically on a ball-bearing turntable, thus avoiding moving parts within the tank. The washer takes cabinet form, the cover of the machine being hinged, as shown in the illustration, to form the rinsing bath, and the wringer arranged to fold down underneath it. Heating is by six 500-W "Chromalox" elements giving alternative loadings of 1, 2 and 3 kW, the tank taking 6-8 lbs. of dry clothes. The whole agitator unit can easily be removed, leaving the tub free for boiling clothes, &c., while by putting a steaming plate on top of the agitator vanes the washer may be used as a steamer.

The new "Prestcold" (above) and "Blackstone" (right) electric washing machines

The outer casing is rectangular and cream enamelled, enclosing a tinned copper washing tank 18 in. in diameter and 14 in. deep. Power for the oscillating mechanism and wringer is supplied by a ¼-h.p. motor through the usual reduction gears. When closed up the cabinet has a useful table top and measures 27¾ in. by 21¾ in. by 36 in. high.

A new model introduced by DRAKE & GORHAM WHOLESALE, LTD., 77, Long Acre, London, W.C.2, has a copper pan, nickel plated internally and fitted with a wide paddle agitator. The flat lid is cut from $\frac{3}{16}$-in. sheet aluminium and a ¼-h.p. ball-bearing motor drives the agitator and wringer through synchromesh gears with spline clutch action. The outer case is rectangular, being made of sheet steel with white enamel finish. A 3-kW heater is fitted and an ironing head can also be obtained.



The "Bar-Spot" washer

A modern streamline effect is produced in the design of three new H.M.V. washers made by the GRAMOPHONE CO., LTD., 104, New Bond Street, London, W.1. They are circular in shape and are mounted on four legs. Three-vane lightweight aluminium agitators are employed and the wringer has a one-piece head with adjustable pressure and instantaneous release. The smaller model has a tank capacity of 12 gal. and the larger size 14 gal., while the rollers of the ironing attachment are 1⅞ in. and 2¼ in. in diameter respectively. The larger model has a motor-driven drain pump, a feature which is obtainable in the smaller size at extra cost. Porcelain enamel inside and out is the standard finish.

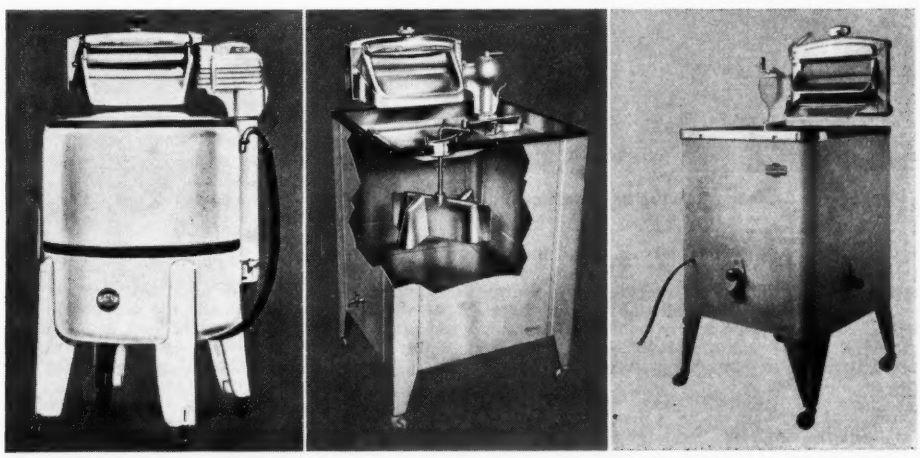
Recent introductions to the British market by J. TOUBKIN, Faraday House, Todd Street, Manchester, 3, are the new "Blackstone" washing machines and "hydractor." The washers are available in four models, the more expensive having various refinements such as a special safety wringer with controlled pressure, triple coat porcelain enamel and motor-driven pump drainage. Helical-drive gears are used and castors enable the tub to be moved with ease. The model "K.1" is combined with a centrifugal water extractor.

Worm drive to the gears is employed by the "1900 Corporation" for its washers which are now being handled by MADISON APPLIANCES, LTD., Windsor House, Victoria Street, London, S.W.1. A self-emptying pump is standard equipment on these washers, which are available in 16- and 18-gal. sizes and have electrically operated safety wringers. Triple-vaned agitators are employed and the transmission mechanism is sealed in an oil-bath.

Some modifications have been made in the design of the "Apex-Vactric" washers made by APEX-VACTRIC, LTD., Honeypot Lane, Stanmore, Middlesex, and we understand that E. K. COLE, LTD., Southend-on-Sea, have acquired the rights to distribute and manufacture the Canadian "Coffield" washers. The six new types to be introduced are expected to include a square cabinet model.

A new streamlined design with a circular tub mounted on legs and castors and fitted with a motor-driven safety electric ironing attachment has also been introduced by the PRESSED STEEL CO., LTD., Cowley, Oxford.

Of the washers we have mentioned, only the "Cotto," "Bar-Spot" and "Dragor" incorporate heating elements. It would appear that this is essentially an English addition, as it is almost an unknown practice in the United States.



From left to right: the H.M.V., "Cotto," and "Dragor" washing machines

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Cable-drum Lifter

As an inexpensive substitute for jacks when cable laying, obviating the need for moving parts, entailing no maintenance charges, and easily operated in confined spaces, the "J.M." cable-drum lifter, illustrated, has recently been produced by the THIRLWELL (PATENT) SLING LOCK & ENGINEERING CO., LTD., 41, Grainger Street, Newcastle-on-Tyne, 1.

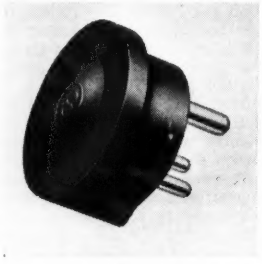
The "J.M." cable drum lifter in position ready for lifting the drum

The mechanism for lifting comprises a quadrant, the radius being flat and of sufficient width to stand firmly on the ground. This is linked by struts to a hollow tubular hub through which the shaft passes, supporting the cable drum.

Unbreakable Plugs

The manufacture of a range of unbreakable plugs has been commenced by WM. SANDERS & CO. (WEDNESBURY), LTD., Falcon Electrical Works, Wednesbury, Staffs.

It is claimed that these plugs may be dropped, kicked or even run over by vehicles and still maintain their efficiency; they are therefore particularly useful in industrial situations for use with any 3-pin 5- or 15-A socket made to B.S. dimensions.



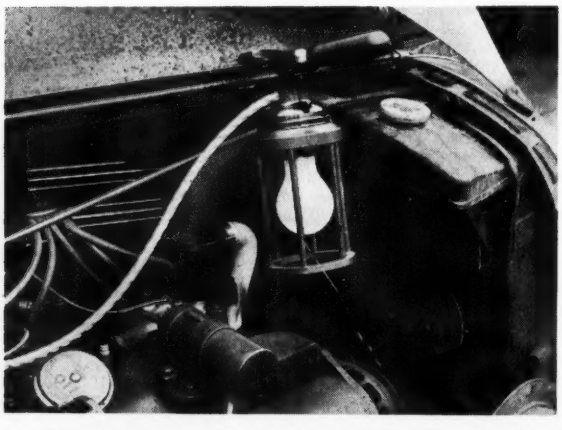
A Sanders unbreakable plug

With the exception of the brass contacts they are made of tough rubber, are easy to wire and have a strong cord grip.

An All-insulated Grip-on Handlamp

The well-known "Gripper" handlamp of the BRITISH CENTRAL ELECTRICAL CO., LTD., 6 and 8, Rosebery Avenue, London, E.C.1, has been completely redesigned and is now being made in an all-insulated form.

The entire unit is moulded, having no exposed metal parts, even the hinge pin being non-metallic. The cable is so arranged that the strongest jerk is arrested and cannot reach the point of connection, and there are no metal screws to fray the wire. We are informed that the handlamp has satisfactorily passed a 7,000-V (50 cycles a.c.) test of one minute, and stepped up in 500-V steps per minute to 13,200 V, when a flashover occurred between the metal foil with which the casing was wrapped.

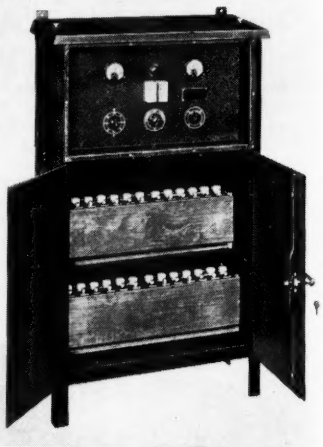


The new "Super-Gripper" bakelite handlamp clamped to a car bonnet

A bakelite cone covers the "live" parts of the lampholder, &c. When this is unscrewed and held reversed the notches engage with the clamping ring of the lampholder, by means of which the ring is unscrewed for wiring, the flex being threaded through a hole in the body of the lamp. For wiring the flex is then wound twice round the circular base, giving a positive lock without any metal parts.

Self-contained Steel Clad Tripping Unit

The increased use of alkaline storage batteries for operating the trip circuits on high-voltage switchgear has brought about numerous improvements and refinements in their make-up and in the provision of accessory gear to comply with modern requirements. The latest of these comes from BATTERIES, LTD., Hunt End Works, Redditch, and consists of an entirely self-contained tripping unit in an all-steel cabinet with all the accessory gear necessary for operating the battery under widely varying conditions. Hitherto no self-contained all-steel tripping unit has been available and this new departure to comply with modern ideas should meet with a ready response from supply companies and switchgear manufacturers.



The "Nife" steel clad tripping unit

The unit consists of a steel cupboard in the lower part of which the steel plate "Nife" battery is accommodated. In the upper part are a copper oxide rectifier and control gear, arranged so that the battery may be maintained either by trickle charging or by occasional charging at a higher rate, provision being made for adjusting the value of the charging current. The whole of these arrangements are operated by means of the "Nife" system of unified control from one knob which is used in the "Neverfayle" emergency lighting sets.

In addition a testing resistance is provided by means of which and a retractive switch the state of charge of the battery may be read directly on a meter in the switch panel. The steel cupboard is provided with a drip-proof lid to allow for installation in unattended sub-stations and also a motor-car type door handle with a lock to make the battery secure against unauthorised attention. The cabinet is arranged for floor or wall mounting.

Lighting Control for Illuminated Bollards

Improvements have been made in the design of the apparatus made by RADIOVISOR PARENT, LTD., 28, Little Russell Street, London, W.C.1, for automatic light sensitive control of street lighting to enable it to be used for bollards. The new equipment, which is known as the "Mark V," has a circuit so designed that should any component of the unit become damaged or defective, the lighting which it controls is automatically switched on and remains on. This action takes place whether the damage occurs during the day or night.

The "Radiovisor" Mark V lighting control unit; left: the bridge housing with bridge inserted

The standard units are mounted in substantial weatherproof cast-iron cases and are supplied in two designs. One, having a spigot cap cast as part of the main casing, is suitable for inserting between the swan neck and the pole of a lamp standard. The other type is for clamping to walls, inside distribution pillars and on to lamp standard poles.

The actual relay circuit and components can be removed from the case by merely sliding them out through the open door. The method of operation is in general the same as the standard "Radiovisor" lighting control unit, namely, the variation in the resistance of a light sensitive bridge.

Mains and Cables in Highways

By a Barrister-at-Law

Should public utilities pay for their removal?

ON the last day of the Parliamentary session, Captain Hudson, the Parliamentary Secretary to the Ministry of Transport, announced in reply to a question by Mr. H. G. Williams, that as a result of preliminary consultations with other Government Departments it had been decided to move for the appointment of a Joint Committee of both Houses to consider the existing provisions of the Gasworks Clauses Act, 1847, and similar Acts, relating to the breaking up of streets.

The decision to appoint a Joint Committee to deal with this complicated and difficult problem is the direct result of the proceedings in the West Yorkshire Gas Distribution Bill, but it may also be considered as the culmination of many years of negotiation between the Highway Associations and the public utility undertakers of the country through the medium of the Conjoint Conference of Public Utility Associations.

Before dealing with the proceedings on the West Yorkshire Gas Distribution Bill, and in view of the importance of the matters to be considered by the Joint Committee, it may be well briefly to review the position, particularly in so far as it applies to electricity undertakers. With regard to the breaking open of streets, the electricity supply industry still works under a code which was compiled long before there was any public supply of electricity. This code was sanctioned by Parliament in 1847, and is contained in both the Gasworks Clauses Act and the Water Works Clauses Act of that year. In the early days of electricity supply it was not felt to be necessary to establish a separate code and, indeed, there was much to commend the suggestion that the same rules should govern all undertakers who were entitled to break open streets for the purpose of laying mains or cables.

In the breaking up of highways public utility authorities are governed by the 91-year-old Gasworks Clauses Act. As a result of recent Parliamentary discussions a Joint Committee is being set up to consider the position.

The Gasworks Clauses Act was therefore scheduled to the Electric Lighting (Clauses) Act, 1899, with a few modifications, principally in favour of the highway authorities which possibly place electricity in a slightly less advantageous position than gas or water. Of these modifications the most important in theory (although possibly little adopted in practice) is that contained in Clause 16 of the Electric Lighting (Clauses) Act, 1899, which gives the highway authorities the right of carrying out the work of breaking open and reinstating on behalf of the statutory undertakers.

It is unnecessary to emphasise the obvious fact that highway conditions to-day vary greatly from those which prevailed some ninety years ago. Not only has the comparatively light horse-drawn vehicle been replaced by motor traffic of the heaviest description, but a science of road surfacing, of which our fathers never dreamed, has arisen. Parishes and rural districts have lost all their highway functions, and many of the urban districts find the financial burden of discharging their duties as road authorities well nigh intolerable. The tendency is therefore to vest the main roads in the county councils, and there are now trunk roads for which the Minister of Transport is directly responsible.

Clauses in Private Acts

The practice has therefore arisen of supplementing the alleged inadequacy of the Gasworks Clauses Act by the incorporation of protective clauses in private Acts and Orders. The results may justly be described as chaotic: there is no uniformity of protective clauses, the provisions of which have depended principally upon the exigency of local circumstances. Some undertakers, anxious at all costs to obtain their Act or Order, have accepted onerous protective clauses which have in after years imposed upon them heavy financial liabilities, while in other cases undertakers have secured provisions definitely to their benefit. Neither does any uniform practice exist among the various Government Departments: a decision of the Board of Trade upon a Gas Special Order might be entirely contrary to that of the Electricity Commissioners in dealing with an Electricity Order. The Ministry of Health might in considering the position of a water company introduce a further variation.

In all these protective clauses the vital question relates to the widening and improvement of roads which in the future, as it has been in the immediate past, will be such a marked feature of our national life. An improvement may involve an alteration of the camber of the road and result in a substantial deprivation of the cover by which mains were originally protected: a widening may have the effect of throwing into the carriage way the footway beneath which mains were originally laid with cover inadequate to the strain of heavy traffic. It is clearly to the interest of the general public and to all concerned that in such cases the mains should be removed, but the vital question is—who is to pay for such removal? Putting the question in another way: Is the cost to fall upon the general body of taxpayers and ratepayers or upon that section only of the community which consumes electricity?

It is true that borough and urban councils (but not county councils) have, under the Public Health Acts, the right to give to gas and water undertakers a written notice to remove their mains, and where such a written notice is given the council must pay the costs involved. This right, however, clearly does not solve the problem, because it might in the opinion of the gas undertaker be necessary to remove a main, but, nevertheless, the council, not wanting to pay the expense involved, might refuse to give a written order.

It is obvious that the public utilities which bring the essential amenities of life to the people of the country cannot be regarded as mere trespassers or interlopers in the highway. The sub-surface user has obligations to the public not shared by the super-surface user of the highways: indeed, it is only because units of heat, light, power and water are carried beneath the surface that the congestion upon the surface of our roads is not far more intolerable than it is at the present time.

In 1925 a Committee of the House of Lords under the chairmanship of the Marquess of Bath refused to impose upon the Northampton Gas Company a highway clause which may be said to have embodied the maximum requirements of the highway authorities. After that year, negotiations between highway authorities and public utilities were opened, and although agreement has on several occasions seemed in sight, it has not matured.

Meanwhile a more equitable protective clause has become common. Under this clause, neither the highway authority nor the public utility is entitled to order the removal of mains. The clause provides that where owing to highway reconstruction it is reasonably necessary so to do, the public utility undertakers may (and if required by the highway authority shall) remove their mains at the expense of the highway authority. This provision depends upon the words "reasonably necessary," and if the parties cannot agree upon what may be "reasonably necessary" the question is to be decided by an impartial arbitrator.

Effective Co-operation

Considerable precedent for a clause in this form, which would appear to be fair both to the highway authorities and to the utilities has now been obtained, particularly in the private Acts of county councils. Although such a clause has usually been obtained as the result of negotiations, it is noteworthy that in the case of the Staffordshire County Council Act, 1937, a decision of Parliament was obtained by which provisions incorporating this principle were inserted for the protection of all the public utilities in the county. This satisfactory result was obtained by the effective co-operation of gas, water and electricity undertakings, whether company or municipal, throughout the country.

The precedents to which reference has been made did not prevent the rupture of the negotiations which had been carried on in the meantime for the purpose of securing a uniform clause acceptable to both parties which would obviate the trouble and delay caused by the constant intervention of highway authorities in public utility legislation. There was, on the contrary, a noted stiffening of the attitude of highway authorities, and the assumption by the Ministry of Transport of direct authority in respect of trunk roads was sure to lead to further complications. The position of the Ministry in this matter is a dual one since it is not only a highway authority, but also the Government Department which is responsible for the electricity supply industry. Until the present time, however, the Ministry has been content to assume whatever rights and liabilities were vested in the authorities from which it took over.

In the West Yorkshire Gas Distribution Bill (now an Act) the question has come to a head. The object of the Bill is to authorise a gas grid in the west of Yorkshire, and for this purpose a company is incorporated for the object of constructing the grid. The County Councils of the Ridings of Yorkshire petitioned against the Bill in order to obtain the incor-

poration of a highway clause, the effect of which would have been extremely onerous to the company. The case for the County Councils was argued in the House of Lords, and during the proceedings a representative of the Ministry of Transport was called before the Committee. It was clear that at that time the Ministry had not formulated any views on the matter, and contented itself with demanding that any protection afforded to the County Councils should be equally applicable to the Ministry. The Committee rejected the proposals of the County Councils.

The importance of this decision was quickly realised, and on the second reading of the Bill in the House of Commons the unusual course of endeavouring to move an instruction to the Committee by which the Bill would be considered was taken by Major Milner. This instruction would have directed the Committee to insert provisions in the Bill "for the further and better protection of highway authorities" in certain matters such as the breaking-up and reinstatement of roads, and the subsequent diversion of mains. After a full discussion, however, the House agreed to leave the whole matter to the unfettered decision of the Committee.

When the Bill reached its second committee stage the whole question was argued from every point of view, and a report was presented by the Ministry of Transport which expressed the opinion that the Gasworks Clauses Act, 1847, was not adequate to modern conditions. Once again the case of the highway authorities was rejected, and a clause entirely satisfactory to the gas company was inserted in the Bill. This clause incorporates the principle to which we have referred above, and imposes upon the highway authorities the obligation to pay for any removal of the gas mains of the company where such a removal is rendered reasonably necessary by highway reconstruction. A substantial victory has thus been gained which will no doubt be of the utmost assistance when the case for public utilities is argued before the Joint Committee.

In dealing with the question of highways, it should never be forgotten that public utilities are normally among the largest ratepayers in their districts, and unlike ordinary industrialists obtain no derating benefits. The use of the highway is the only material benefit which they obtain from the thousands which they contribute to local rates. It is, naturally, necessary for an electricity undertaking to include these large sums in the charges for electricity.

I cannot think that where road reconstructions carried out for the benefit of the motoring public render the removal of mains necessary, any part of the cost involved should fall upon the electricity consumer. The researches of the Joint Committee must obviously be wide and far-reaching, and the views of the industry will no doubt be placed before them. It is a matter of vital urgency that the existing chaotic state of the law should be clarified.

New Books

Electrical Engineering, by C. V. Christie. Fifth edition. (Pp. 717; figs. 604.) London: McGraw-Hill Publishing Co., Ltd. Price 30s.

The author of this work has incorporated some useful additional matter in preparing it for a fifth edition. The theory of synchronous generators and motors has been amplified, and there are three new sections on the theory and design of three-winding transformers. In the chapter on the induction motor more use has been made of the idea of the equivalent circuit, in order to bring out the essential similarity of this machine to the static transformer. There is also an additional final chapter in which a somewhat condensed account is given of the theory of symmetrical components and its application in the analysis of fault conditions. Finally, there are some brief additional notes on the single-phase induction motor.

The book gives a very good and sound exposition of applied electrical theory, starting with basic principles of electrostatics and electro-magnetism, passing on to d.c. and a.c. circuits, and finally developing the application of these elements in a detailed treatment of the theory and operation of all classes of electrical machinery and of transmission lines. The mathematics is generally fairly easy, although not always as simple as it might be, and the book is suitable, not only for the student, but also for the reference library of the practical engineer.

The subject of electrical measurements is so wide that the author cannot be criticised for ignoring it in this book and concentrating on the theory and operation of electrical machinery and transmission lines. Having limited himself to these fields, however, he seems to have been somewhat superficial in his references to frequency changers and arc rectifiers, while the classical theory of the rotary convertor with its cumbersome mathematics is set out in full. In view of the trend of modern practice, this is not what one might expect in an up-to-date work. The illustrations are numerous and excellent, there is a good index, and a fair selection of problems for solution by the student, but the answers to these problems are not given.—G. W. S.

Electro-plating. By S. FIELD and A. D. WEILL. (Pp. 381; figs. 89.) London: Sir Isaac Pitman & Sons. Price 12s. 6d.

The popularity of this book is evidenced by the early succession of its third edition upon the second which appeared late in 1935. The new edition is greatly improved and enlarged. It appears at a time when two major developments in this country have reached approximate finality, namely, that of the cuprous oxide copper rectifier for plating-current supply, and of bright nickel plating.

Drastic advancements such as these do not occur frequently so that for a number of years to come the book will be up to date because both these developments are fully treated. One of the authors—A. D. Weill—is known to have had a considerable personal influence in the industrialisation of a bright nickel plating process so that the first hand information on this subject available in the book will be welcome to many not yet familiar with it, or to those contemplating its adoption.

The book further gives a clear indication of the gradual emergence of electroplating from the stage of infancy in that scientific control methods are becoming more recognised and the old "hush-hush" and rule-of-thumb methods, which were the delight of the old-fashioned platers, are gradually dying out. No longer need the manufacturer who is forced to operate a plating shop be mystified by his foreman plater; this book will give him all the information necessary for costing purposes as well as enable him to set up analytical control of processes operated by any intelligent person who takes an interest in plating, or any semi-skilled chemist. All the known control methods are clearly described and indications given how they can be applied to produce deposits to given specifications, and to eliminate or cure troubles.

There is no doubt that the book will remain the handbook of all those interested in the practical side of electro-deposition as it has been in the past and many users of the older edition will acquire the new one in order to obtain the benefits of the progress of recent years to which so much space is devoted.—J. K.

Physik. By DR. P. WESSEL. (Pp. 514, figs. 277). Munich: Reinhardt. Price RM. 4.9.

Physics to-day is a subject of immense range and interest. It is particularly valuable to examine what has been done in the volume under review to present the various branches of the subject to relatively advanced students.

The book is divided into three main sections. The first deals with mechanics, acoustics and optics, the second with electricity and magnetism, and the third provides a summary of the first two sections and a list of test questions. The standard reached is roughly that required for an ordinary science degree in a British university.

While all the material is presented in a clear and concise manner, it is doubtful whether the average student would be able to master the contents without additional tuition. As a basis for courses of lectures, however, the book is admirable. It is particularly useful as an introductory treatise on atomic physics. The worked examples which are included are eminently practical. There are 1,447 test questions which would assist a student in proving his ability to talk or write about the subject, but without necessarily being able to do much of a practical nature. The diagrams are of the rather "thin" type, which are apparently acceptable to physicists. Printing and production are both very good, and the book is excellent value for the modest price asked for it.—C. W. M.

Shorter Notices

"Where Do We Go From Here?" Edited by J. Mayers and B. Spiers. (Pp. 271). London: Frederick Muller, Ltd. Price 8s. 6d. net.—In this collection of prophecies of things to come in many spheres—aviation, dietetics, education and housing among others—Miss Caroline Haslett takes part with an article "Electricity—To-morrow's Handmaid." She paints an attractive picture of the electrical future with its smokeless air, easy travel, air conditioning, adequate and properly planned lighting, improved rural living, and labour-free homes. Mr. J. L. Baird contributes a chapter on television.

"Radio-Frequency Electrical Measurements," by H. A. Brown. (Pp. 384; illus.). London: McGraw-Hill Publishing Co. Price 24s.

"Automobile Electrical Maintenance," by A. W. Judge. (Pp. 248; figs. 147.) London: Sir Isaac Pitman & Sons. Price 4s. 6d.

"Electron and Nuclear Physics," by J. Barton Hoag. (Pp. 502; illus.) London: Chapman & Hall. Price 20s.

"Electrical Engineering Practice," by J. W. Meares and R. E. Neale. Vol. I, 5th ed. (Pp. 780; figs.; illus.) London: Chapman & Hall. Price 25s.

"Direct and Alternating Currents," by E. A. Loew. 2nd ed. (Pp. 730; illus.) London: McGraw-Hill Publishing Co. Price 25s.

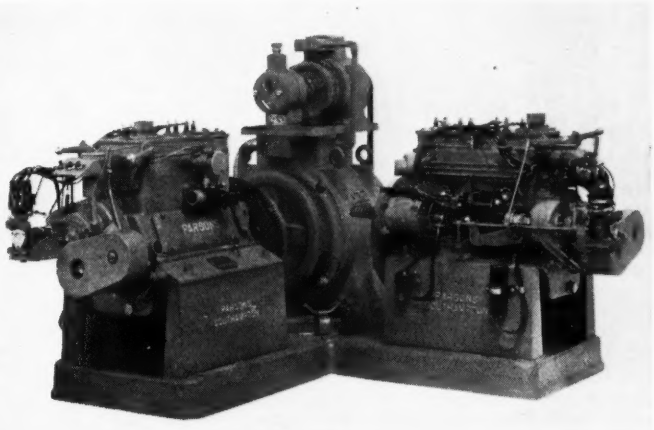
"A Dictionary of Electrical Terms," by S. R. Roget. 3rd ed. Pp. 425. London: Sir Isaac Pitman & Sons. Price 8s. 6d.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

An Unusual Generating Plant

The compact generating set illustrated was recently built up by the Parsons Engineering Co., Ltd., for conditions where it was essential to avoid failure of supply. It consists of two similar standard "Industrial" type D4S 10-20 h.p. petrol engines mounted on an L-shaped bed plate. The engines, which have been designed for continuous service in a tropical climate, are fitted with two systems of ignition, electric starting and a centrifugal water pump giving rapid circulation. The alternator, by Lancashire Dynamo & Crypto, Ltd., is provided with an exciter and automatic regulator mounted on the top of the machine and belt-driven from an extension of the alternator shaft. The electrical unit is fixed to a swivelling turn-table pivoted on the intersection of the centre lines of the engine bases and capable of being swung through 90 deg., when it is locked in position immediately. Quick-release couplings give the advantage of a dog drive without back lash. In the event of a breakdown of one engine it can be easily dismantled, a large hand-hole door providing means of inspecting the whole of the working parts by the removal of six nuts.



Two petrol engines and 5-kVA alternator with swivel mounting

Egyptian Lamp Import Duties

A list of new duties on goods imported into Egypt is published in the *Board of Trade Journal*. The new duties have been enforced as from July 11th and will apply to all goods on which duty has not been paid on that date. Included in the list are electric lamps, the new duties on which are as follows (former duty in parentheses):—40 W and less, no change (8 milliemes each); over 40 up to 60 W, no change (10 m.); over 60 up to 100 W, 15 m. (12 m.); over 100 up to 200 W, 35 m. (15 m.); over 200 up to 300 W, 45 m. (30 m.); over 300 up to 500 W, 65 m. (30 m.); over 500 up to 1,000 W, 100 m. (40 m.); over 1,000 W, 150 m. (80 m.).

Training for Business Management

The appeal for an endowment fund of £100,000 which was launched last September on behalf of the Department of Business Administration, at the London School of Economics in the University of London, has not yet achieved its full objects. It had been hoped to raise a sum, the income from which would not only make the finances of the Department permanently secure, but would enable it to carry out several much-needed developments. Further donations are urgently required in order fully to achieve the purposes of the appeal. The amounts so far subscribed will nevertheless be sufficient to ensure the maintenance of the Department on its existing scale for a further period of seven years. A recent important development for London evening students is a change in the regulations governing applications for L.C.C. senior scholarships. These are now available to students wishing to attend the Department's one-year post-graduate course, provided that they have a London residential qualification. Applicants must have been employed in business and have attended evening classes for at least two years at the London School of Economics or at a polytechnic or a technical institution. The scholarships cover fees plus a maintenance allowance which, for self-supporting students, may be as much as £160 a year. For the 1938-39 course there are available a Leverhulme post-graduate scholarship, value £120 per annum, and also a limited number of bursaries, equivalent to the remission of fees.

Instrument Manufacturers' Fusion

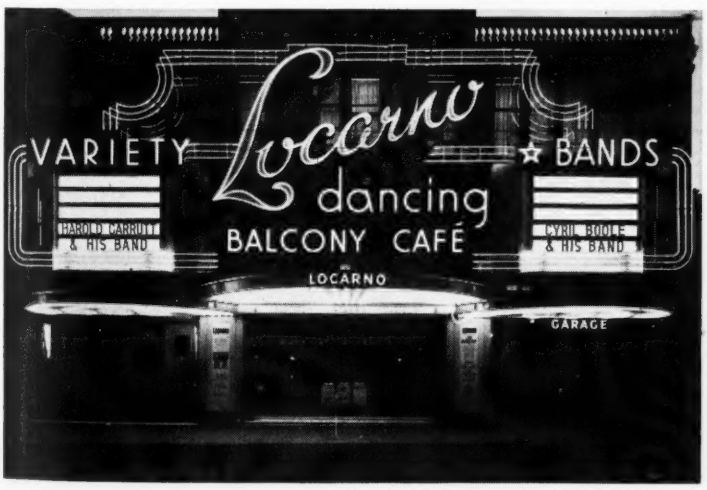
According to *The Times*, the directors of the British Sangamo Co. propose to effect a complete amalgamation of the company with the Weston Electrical Instrument Co., a controlling interest in which was acquired in 1936. Negotiations are in progress for the acquisition of the remainder of the issued capital of the Weston Company in exchange for 12,000 10s. shares of the British Sangamo Co. It is also proposed to change the name of the company to Sangamo Weston, Ltd.

Aluminium Works Extensions

Large-scale extensions to the Banbury works of the Northern Aluminium Company, Ltd., are announced. Building operations are now well advanced and the new extension plan when completed will approximately double the present capacity for manufacturing aluminium and special aluminium alloys in semi-finished form. New plant being installed includes a 5,000-ton extrusion press, which will produce the large extruded sections required for lighter transport developments.

A Large Neon Installation

The accompanying illustration shows an interesting lighting installation carried out at the Locarno Dance Hall, Glasgow. In this "Claudgen" installation the word "Locarno" is in inverted trough letters, the L being 20½ ft. high, with a double outline of 20 mm. red tubing. 11 mm. "Cleora" fluorescent tubing No. 103 (amber) is used for the rest of the wording above the canopy and the tube border round the sign consists of 318 ft. of "Cleora" No. 22 (light green) and 160 ft. of No. 30 (peach). The two interchangeable signs are each 11 ft. 3 in. by 14 ft. overall, illuminated by a band of red tubes behind lenticular glass against which the cut-out interchangeable letters stand out in silhouette. The word "Locarno" on the canopy and the sign "garage" are in 12 in. letters illuminated by 15 mm. red tubing; 361 ft. of amber and 72 ft. of pink are used in the under-canopy installation.



The Locarno Dance Hall sign

Long Service

A tribute to the loyalty of the staff was paid by Mr. W. Bulpitt, chairman of Bulpitt and Sons, Ltd., at the recent annual meeting of the company, when he said that some idea of the good relationship that existed between the management and the staff was reflected in the average length of service with the company. Of the total, 145 (24 per cent.) had over ten years' service, forty-three over twenty years', eight over thirty years', and seven over fifty years'.

Attractive Publicity

The Jackson Electric Stove Co., Ltd., has published an attractive folder dealing with the "Backer-Jackson" boiling plate. The illustration on the cover, shown in the accompanying picture, is an effective introduction to the contents inside. The frame is in gold, while the picture of the plate is reproduced in red on a black background.

The cover of a new Jackson folder

Australian Electrical News

Our Australian correspondent reports that with the setting in of wintry weather the sales of radiators, electric fires, &c., have increased enormously and the cheap lines offered by the chain stores have done little to affect the moving of the really good lines. Electric bath heaters have been selling well, as have those of the domestic type. A feature of electric lighting fittings of late is the large and steady inquiry for those of the more expensive and most modern types.

An investigation of the hydro-electric resources of North Queensland will be undertaken shortly by the State Electricity Commission. This investigation will embrace the Barron Falls scheme, the Tully Falls, Herbert River and other waterways. The hydraulic portion on the investigations will be under the charge of Mr. W. H. Nimmo, chief engineer of the Stanley River Works Board.

The lighting of main thoroughfares with sodium lanterns is becoming increasingly popular throughout the Commonwealth, and a deal of attention is being paid to the safety factor of this modern form of lighting.

A report recommending the adoption of a standard system of lighting for main roads will shortly be placed before the New South Wales cabinet. An agreement has been reached by the Roads Safety Council on the method of defraying the costs of such standardisation, and the Sydney County Council has decided to reduce the cost of current for street lighting sold to municipalities by 30 per cent.

The Prague Fair

The thirty-seventh Autumn Fair will be held in Prague from September 2nd to 11th. The bulk of the exhibitors comprise glassware, porcelain, toys and manufactured leather goods, but there are also sections for kitchen and household requisites, technical articles, textiles, &c. Buyers travelling to the Prague Fair will be granted a 50 per cent. fare reduction in Czechoslovakia, and considerable facilities on other European railways, ships, and air-lines.

A Large Private Telephone Exchange

A new private automatic telephone system has been installed in the head offices and warehouses at Great Eastern Street of Brown Bros., Ltd. This exchange has been provided to afford rapid interworking between all departments. The capacity of the present equipment is for 200 lines but with the addition of another switching stage this can be increased to 1,000 lines. There are now thirty-three exchange lines with 258 extensions and five extensions from these. Of the extensions twenty-seven are either duplicated or triplicated. Five operators are in charge of this service.

Municipal Trading at Eastbourne

The Eastbourne Corporation Electricity Committee has recommended the Corporation to exercise fully the powers vested in it for the sale of electrical fittings, &c., and to terminate the arrangement with the local branch of the E.C.A., whereby electrical fittings are supplied only through electrical contractors.

British Electrical Exports to New Zealand

New Zealand's imports of British electrical machinery and equipment during the first three months of the current year were valued at £NZ523,670, or 73 per cent. of the Dominion's total imports of electrical goods from all sources.

Discharge Lighting for Merchandise Displays

A 32-page booklet (price 6d.) has been published by Rowlands Electrical Accessories, Ltd., dealing with the "balanced light" principle, whereby satisfactory use can be made of mercury electric discharge lamps for interior display lighting. Full details are given of the lay-out of lamps and of the illumination necessary for various types of interiors.

Electricity Supply Rifle League

As a result of the matches shot during July the leaders of the various divisions of the Electricity Supply Rifle League are as follows:—Division 1: City "A." Division 2: City "B." Division 3: J.E.A. (Twickenham). Division 4: Gravesend.

Popularising Electric Cooking

The English Electric Co., Ltd., has produced a new display cut-out for use in connection with its electric cookers having "Ritemp" automatic oven control. It has been designed for use in supply authorities' showroom windows, showroom interiors or at exhibitions and cooking demonstrations. Its purpose is to draw the attention of the public to the freedom from the kitchen to be gained by cooking automatically under "Ritemp" oven control. The cut-out is produced in several colours and the woman with the shopping basket is most realistic.

A new English Electric display cut-out

Electrical Imports of Portuguese East Africa

As a result of the balancing of the budget, rising prices of crops, and increased prosperity on the Rand the Government of Portuguese East Africa has relaxed somewhat the severe import and exchange restrictions imposed in 1932, and this factor, together with increased public expenditure on the ports and railways, on public works and on the execution of the six-year development plan, has given a much needed fillip to importation. Mr. S. E. Kay, M.B.E., H.M. Consul-General, Lourenço Marques, in his report to the Department of Overseas Trade on economic conditions in Portuguese East Africa, states that in these circumstances it behoves United Kingdom manufacturers to devote close attention to this market, for although the United Kingdom is not the best customer of the Colony, her goods have always been welcomed by local trade. The value of imports of electrical

The telephone exchange at Brown Bros. Great Eastern Street offices

machinery and lighting fittings into the Government-administered territory increased from £9,125 to £23,907 in 1936, of which Germany's share rose from 32 per cent. to 73 per cent., at the expense of the United Kingdom. Mr. C. N. Ezard, H.M. Consul, Beira, in his report on the territory of the Mozambique Company, states that there has been a fair and increased sale of electrical goods in the territory during 1936 and 1937, although almost entirely limited to Beira and the sugar and cotton estates. The market in Beira is a rather difficult one as the system of supply is 220 V d.c. and manufacturers probably give less attention to products for this rather obsolescent system, which on account of the smaller world demand are dearer than material for a.c. The use of electrical apparatus such as electric cookers, vacuum cleaners and heaters, would, no doubt, be greater in Beira were it not for the very high cost of current. In general equipment the market is shared by the United Kingdom, the United States, Czechoslovakia and Germany, with Belgium as an occasional exporter. Radio receiving sets are supplied by the United States. The market for these sets differs from almost all others in this territory in that the demand is for expensive and not for medium-priced or cheap sets.

Trade Announcements

The fire which occurred recently at the works of Donald MacPherson & Co., Ltd., Cornbrook, Manchester, was confined to the store room for one department, and the company states that there will be no dislocation of business.

The Nelson Engineering Co., Ltd., has removed to Netherfield Works, Netherfield Road, Nelson, Lancs.

Lionel Robinson & Co., Ltd., have returned to their old address at 3 and 4, Staple Inn, Holborn, W.C.1.

The Plugit Wall Plug Co., Ltd., 15, Islington Park Street, N.1, has purchased the patents and assets of the old Wall Plug Co., Ltd., and is now in full production of "Plugit" wall plugs and drills. The retail prices of the outfits and drills are unaltered.

The telephone number of Beantee Illuminations, Ltd., has been changed to Clerkenwell 3644-5.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price August 10th.	Fortnight's Inc. or dec.
t Acid Oxalic ... ... per cwt.	50s.	—
t Ammoniac, Sal ... ... per ton	£36	—
t Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax... ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£22 10s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4¼d.	—
a ,, Perchlorate .. .. ,,	8d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94 to £99	£6 dec.
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/3 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£184	£5 inc.
Grade II ... ... ,,	£129	£2 inc.
Grade III ... ... ,,	£71	£2 dec.
c Brass (rolled metal 2" to 12" basis)... per lb.	8d.	—
c ,, Tubes (solid drawn) ... ... ,,	11¼d. to 11¾d.	¼d. inc.
c ,, Wire, basis ... ... ,,	8¾d.	¼d. inc.
c Copper Tubes (solid drawn) ... ,,	1/0¼d.	—
g ,, Bars (best selected) ... per ton	£78	£2 inc.
g ,, Sheet .. .. ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£47 15s.	15s. inc.
d ,, ,, Wire Rods ... ,,	£52 10s.	15s. inc.
d ,, ,, H.C. Wire ... per lb.	7¾d.	—
f Ebonite Rod ½" dia. & up.... ... ,,	1/10 to 2/5	—
f ,, Sheet ⅛" thick & up ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12 ... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	7¾d.	¼d. inc.
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1 P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£16 10s.	10s. dec.
g Mercury ... ... per bot.	£13 10s.	—
e Mica (in orignal cases) small ... per lb.	10d. to 2/-	—
e ,, ,, ,, medium ... ,,	6/- to 12/6	—
e ,, ,, ,, large ... ,,	13/- to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2¾	—
p ,, ,, drawn bars & rods ,,	1/0¾d.	¼d. inc.
p ,, ,, rolled strip & sheet ,,	11d.	¼d. inc.
p ,, ,, wire ... ... ,,	1s. 1d.	¼d. inc.
o Platinum ... ... per oz.	£7 5s. 0d.	12s. 6d. inc.
d Silicium Bronze Wire ... ... per lb.	8¼d.	⅛d. dec.
g Spelter ... ... per ton	£13 18s. 9d.	5s. dec.
g Tin, Block (English) ... ... ,,	£194	10s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/6	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Trolley Bus Equipment

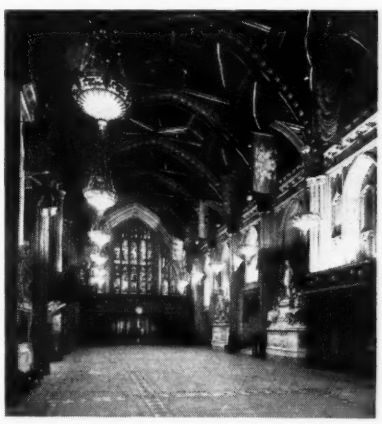
The General Electric Co., Ltd., has recently received a number of important orders covering the electrical equipment for nearly fifty trolley buses for which the chassis will be manufactured by Leyland Motors, Ltd. Overseas orders come from South Africa and Australia. Thirty-four equipments will be manufactured for Pretoria, South Africa, twenty-four being designed for single-deck buses and ten for double-deck buses. In the case of Australia five equipments will be made for Perth (Western Australia) and two for Hobart (Tasmania); these are for three-axle single-deck buses, and in each case they represent the third successive order received by the G.E.C. from the municipalities concerned. For the home market four equipments have been ordered by the South Lancashire Transport Co., these being identical with G.E.C. equipments already in service on the South Lancashire system. All these trolley-bus equipments will be of the single-motor type, comprising an 80-h.p. motor with electro-magnetic control gear and auxiliaries, the whole of which will be manufactured at Witton. The motors for the Pretoria and Lancashire buses will be arranged for rheostatic braking, while those for Perth and Hobart will be of the series-wound type.

Important Steelworks Contract

A contract has just been obtained by the Metropolitan-Vickers Electrical Co., Ltd., for the complete electrical equipment for the new cold rolling plant to be installed by the Whitehead Iron and Steel Co., Ltd., at its Courtybella Works, Newport, Mon. The contract, which includes a total of over 6,000 h.p. of machines, comprises the main and auxiliary drives for a 4-stand, 4-high tandem cold strip mill and for two single stand, 4-high cold strip mills, complete with motor generator sets and switch and control gear. The tandem cold strip mill can be operated either as a three- or four-stand mill, being equipped with two motor-driven coiling reels, one between the third and fourth stand for use when operating as a 3-stand mill, and the other following the fourth stand for use when operating as a 4-stand mill. Each of the single-stand mills is also equipped with a separate motor-driven reel, and the equipment is specially designed to maintain constant tension in the strip between the reel and the mill over a wide range of speed and tension requirements. The contract for the mill itself has been placed with the Davy and United Engineering Co.

Lighting at the Guildhall

For the recent banquet of the International Electrotechnical Commission, which was arranged by the B.S.I., a special lighting scheme devised by B.T.H., Ediswan, G.E.C. and Siemens lighting engineers, was carried out to illuminate the roof of the hall. The lighting was a difficult problem owing to the black nature of the structure, which is of the open type and is an arrangement of heavy timbers having their chamfered edges gilded. Fourteen 1,000-W floodlights of the horizontal pattern were employed and these were accommodated in the side windows and galleries, with very pleasing effect.



The lighting of the Guildhall for the recent I.E.C. banquet

Birmingham Hospitals Centre Appeal

Contributions to the Appeal Fund (fifth list) of the Birmingham Hospitals Centre (one of the largest hospitals and medical schools in Europe) which was recently opened by the Duke of Gloucester were published last week. They include the following: General Electric Co., Ltd., £3,000 (total); G.E.C. (Employés' Benevolent Fund), £1,000; Joseph Lucas, Ltd., £12,000 (total); Mr. Oliver Lucas, £1,000; George Ellison, Ltd., directors, staff and foremen, and Ellison Insulations, Ltd., £1,250; Callender's Cable & Construction Co., £155; British Industrial Plastics, Ltd., £155; Electrical Components, Ltd., £100.

Electrical Propaganda at Dublin Horse Show

No more attractive exhibit and demonstration for the promotion of the electrical idea has been staged in Ireland than the Electricity Supply Board stand at the Dublin Horse Show last week. The Board's permanent stand had been entirely redesigned with marked improvement from the display point of view. Part of the space was occupied by the usual stock-in-trade of the supply undertaking, which desires to concentrate effort upon the development of domestic load, but the

main feature consisted of a complete working kitchen in miniature, all scaled down to the size of the cooks, who were children aged not more than twelve. Nearly a score of these had been trained for three months by Miss Fitzpatrick, one of the Board's cookery demonstrators. They worked in shifts of five or six and completed two menus daily. These menus included fish and chips, waffles, jellies, blanc mange, scones, griddle bread, cakes, tarts, and sweets of many sorts, stews, vegetables, and so on. All the products were *en petite* in consonance with the dimensions of the apparatus, but all were perfect examples of the larger cookery of life outside the doll's house. In addition to cooking, the children did the laundering and ironing of their frocks and dolls' clothes, and a miniature refrigerator took care of the food supplies to the well-lighted doll's house at the back of the stand. The outstanding novelty in the general section of this stand was an American automatic roaster, which purports to cover the whole range of cooking, and seems the ideal appliance for the flat-dweller in particular.

Young launderesses at the Dublin Horse Show

Appointments Vacant

Consumers' engineer for Clacton Electricity Department.

Two development officers for Darlington Electricity Department.

Lady showroom attendant and demonstrator for Morley Electricity Department.

Senior demonstrator (female) for Hackney Borough Council.

(See our classified advertisements.)

Coil Forming and Winding

The new series "Micafil News" (Zurich) illustrates and describes an unusually large variety of Swiss machines for winding coils of numerous types and shapes for different purposes. There are also machines for forming and applying several kinds of insulation to the coils of motors and generators; others for taping conductors with fabric and wire, for binding armatures with wire and for milling the conductor ends after they have been soldered. Coil-presses are made with provision for heating and cooling, and there are machines for turning, grinding and undercutting commutators, together with machines for applying eddy current insulation, stamping and removing burr, lamination papering and varnishing the steel sheets employed in the construction of dynamos and transformers. The sole concessionaire for London and the Dominions is Impag (London), Ltd., 10, Lloyd's Avenue, London, E.C.3.

An Explanation

The Anti-Attrition Metal Co., Ltd., asks us to state that the note which appeared under the heading of "Company Liquidations" in our last issue related to the old company, incorporated in 1886. The notice was a purely formal one.

New Catalogues and Lists

J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.—Leaflets dealing with B.S. cooker control units and 3-pin shielded socket outlets.

Londex, Ltd., Brettenham House, Lancaster Place, London, W.C.2.—New leaflets regarding special time delay relays, a one-hole signalling lamp, and an electromagnetic counter.

Harcourts, Ltd., 1, Kean Street, Aldwych London W.C.2.—Leaflets illustrating lighting fittings and combined lighting and heating units.

British Insulated Cables, Ltd., Prescot.—A complete 68-page illustrated catalogue of materials for overhead telegraph and telephone lines.

Park Bros., Ltd., Brunswick Works, Canterbury Street, Blackburn.—Details of "Commercial" spun glass insulated omnibus, trolley bus and commercial vehicle batteries.

Brown Bros., Ltd., Great Eastern Street, London, E.C.2.—A catalogue of domestic appliances.

English Electric Co., Ltd., Domestic Appliance Works, Preston.—A new catalogue of electric fires, fully illustrated.

Ever-Ready Radio, Ltd., Eley's Estate, Angel Road, Edmonton, London, N.18.—A leaflet containing specifications of the company's radio receivers.

Shelley Potteries Ltd., Longton, Stoke-on-Trent.—A booklet illustrating a range of pottery table lamps.

Rheostatic Co., Ltd., Slough.—Details of the "Satchwell" type "P.M." pulling motor.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Leaflets dealing with dividing boxes, automatic service equipment, switchgear, protective gear, Holmes hydro drive a.c. motors, and a Glasgow Exhibition souvenir comprising a booklet describing the company's works.

Receiver Appointed

Gambrell Radio Communications, Ltd. (in liquidation).—Two notices have been registered of the appointment of J. F. Mallabar, of 1, Regent Street, S.W.1, as receiver on July 25th, 1938, under powers contained in debentures dated December 21st, 1936, and December 16th, 1937.

Private Arrangement

C. P. Sunderland, radio and electrical dealer, 71, Orford Lane, Warrington.—At a recent meeting of creditors a statement of affairs was presented showing ranking liabilities of £222, of which £152 was due to the trade and £70 to cash creditors. After allowing £19 for preferential claims the net assets were £123, leaving a deficiency of £99. It was stated that the cash claims would be withdrawn if the matter was dealt with under a deed of assignment. It was resolved that the estate should be administered under a deed of assignment to Mr. A. G. Calwell with a committee.

Company Liquidations

Sellers of Leeds Ltd., radio factors, Park Place, Leeds.—At the statutory meeting of the creditors held recently at Leeds the statement of affairs presented showed ranking liabilities of £13,215. After allowing £244 for preferential claims the net assets were £5,487, leaving a deficiency as regarded the creditors of £7,728. It was reported that an informal meeting of the creditors was held on July 14th, when it was suggested that the company should be granted a moratorium and an informal committee was appointed to consider the position and evolve a scheme. But as certain creditors had commenced proceedings, it was thought necessary for a resolution for voluntary liquidation to be passed, and Mr. J. A. Couper and Mr. P. Cardwell had been nominated joint liquidators. It was still hoped, however, that a scheme would be brought forward and an offer made for the business as a going concern. The creditors decided to confirm the voluntary liquidation of the company with the liquidators appointed by the shareholders, and also appointed a committee consisting of Mr. H. W. Hallas and the representatives of the Ever Ready Co., Ltd., the General Electric Co., Ltd., Kolster Brandes, Ltd., and Richard, Son and Alwin.

Oxford Electric Co., Ltd.—Winding up voluntarily. Particulars of claims to the liquidator, Mr. E. J. Harrison, 11, Waterloo Place, S.W.1, by September 7th.

Light & Power Contractors (Liverpool), Ltd.—Winding up voluntarily. Particulars of claims to the liquidator, Mr. W. Lodge, 1-3, Stanley Street, Liverpool, by August 31st.

South West Electricity, Ltd.—Winding up voluntarily. Liquidator, Mr. B. R. Dunning, Honiton, Devon.

Bankruptcy Proceedings

O. Wales, 82, Rusper Road, Horsham, Sussex, electrical engineer.—This debtor's public examination was closed on July 29th at the Court House, Brighton, when it was reported that the ranking liabilities amounted to £163 and the assets to £34, leaving a deficiency of £129. Debtor stated that his failure was chiefly due to slackness of trade.

J. H. Thompson (C. M. Hawkins & Son), electrical contractor, 186, Lodge Lane, Liverpool.—Receiving order made July 28th on debtor's own petition. Public examination September 13th at the Court House, Liverpool.

J. J. Scott, electrician, 3, Clifton Street, Lytham.—Public examination October 7th at the Court House, Blackpool.

R. W. Burrows (Radio Services), radio and electrical engineer, High Street, Skegness.—Last day for receiving proofs for dividend August 17th. Trustee, Mr. E. C. Midgley, 1, St. Swithin's Square, Lincoln, Official Receiver.

A. T. White, electrical engineer, Radio House, High Street, Hadlow.—Last day for receiving proofs for dividend August 19th. Trustee, Mr. A. E. Orbell, 6-7, Old Steine, Brighton.

A. E. Barrow, wireless and electrical dealer, 95, Swaine House Road, Five Lane Ends, Bradford, formerly residing and carrying on business at 217, Huddersfield Road, Low Moor, Bradford.—First and final dividend of 11d. in the £, payable August 5th at 71, Manningham Lane, Bradford.

H. Nuttall (J. A. Hartley & Co.), electrical agent and factor, 1073, Chester Road, Stretford.—Supplemental dividend of 12s. 3d. in the £, payable August 12th at the Official Receiver's office, Byrom Street, Manchester.

J. J. Eastick & Sons, wireless factors, 118, Bunhill Row, E.C.—Receiving order made July 22nd on a creditor's petition. First meeting August 17th and public examination November 2nd at Carey Street, W.C.2.

C. H. Chadwick, wireless dealer, Mill Road, Cromer.—Receiving order made August 2nd on debtor's own petition.

Dissolution of Partnership

Alexander & Osborne, electrical and radio engineers, 3, Brough Lane, Trentham, Stoke-on-Trent.—Messrs R. D. W. Alexander and C. Osborne have dissolved partnership. Mr. Alexander will attend to debts.

Winding-up Petition

Watmough (Wakefield), Ltd.—A petition, presented by the General Electric Co., Ltd., for the winding-up of the above company is to be heard at the Court House, Wood Street, Wakefield, on August 16th.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

QUADRANT motor plough.

NEWLAND heater.

RECORD vacuum cleaner.

STEINERIZER electric vulcaniser.

Electricity Supply

Lighting, Domestic, Power

Barrow-in-Furness.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to the Links estate, Walney, at a cost of £938.

BULK SUPPLY TO MILLOM.—The provision of a bulk supply to the Millom Rural District Council is under discussion by the Electricity Committee.

Bexhill. — EXTENSIONS. — Mains extensions are to be carried out to supply new premises in Wychurst Gardens, off Wrestwood Road, at an estimated cost of £498.

Blackburn. — ARTERIAL ROAD LIGHTING.—The Lighting Committee has asked the gas and electrical engineers to submit plans for lighting the Arterial Road from Yew Tree Drive to Brownhill.

Blackpool. — The following amounts are to be allocated out of the profits:—£12,105 for rate aid; £10,000 for new meters; £2,000 for meter testing equipment; £8,000 for new transformer houses and equipment; £7,000 for replacing old switchgear and transformers; £5,000 for "Mulsifyre" equipment; and £12,208 transferred to reserve fund.

Holophane colour floodlighting at the County of London Electric Supply Co.'s new Central Accounts Office at Wandsworth (See next page)

Brighton.—ANNUAL REPORT.—In his annual report Mr. W. N. C. Clinch, the borough electrical engineer and manager, reports that there are now 9,872 cookers connected, all but about 400 having been added during the last five years. The price of coal rose from 19s. 8½d. to 20s. 10½d. per ton, the relatively small increment being due in a large measure to the use of the Corporation's own colliers. Within the extended boiler house erection is proceeding of two Babcock & Wilcox boilers, each capable of evaporating 215,000 lb. of water per hour, while in the turbine room a second Brush-Ljüngstrom turbo-generator (37,500 kW) is nearing completion.

Brora.—LINK WITH GRID.—The town is now connected up with the Grampian electricity supply, the last of the connections being made this week. For the past twenty-five years electric lighting has been supplied to Brora by Messrs. T. M. Hunter's Woollen Mills.

Canterbury.—ILLUMINATIONS.—No charge is to be made for the electricity used for the special lighting at Westgate Gardens, Westgate Towers, and Christchurch Gateway during Cricket Week. The arrangements for lighting were carried out by the local Chamber of Trade.

Cheltenham.—ILLUMINATIONS SCHEME.—The borough electrical engineer has submitted to the Chamber of Commerce a scheme for illuminating Montpellier Walk during the special shopping week in November next at an estimated cost of about £223 and the Chamber has approved the scheme in principle subject to the Corporation agreeing to pay half the cost. The estimate included the sum of about £150 for the purchase of necessary apparatus and fittings, which would afterwards remain the property of the Corporation.

BETTER STREET LIGHTING.—The Electricity Committee has approved a scheme for improving the lighting of Leckhampton Road by replacing the existing twenty-five filament lamps with sodium lamps and erecting twenty-two additional sodium lamps at a total estimated cost of £538.

Chester-le-Street.—SUPPLY TO HOUSING ESTATE.—The Rural District Council has discussed with representatives of the North-Eastern Electric Supply Co., Ltd., a proposal for the company to take over the supply of energy to the Council's housing estate at Bullion Row. The question is to be reconsidered next month and in the meantime the Supply Co. is being asked to submit a definite offer.

Colchester.—EXTENSIONS.—The Town Council is to extend the low-voltage distribution to the following districts:—Prettygate Road (Magazine Farm end), estimated cost, £93; Prettygate Road (King Harold Road end), £66; Rivers Hall Cottages, Boxted Cross, £45; Barn Hall Avenue and Cavendish Avenue, £139, subject to the engineer being satisfied as to the proposed building development in Prettygate Road, and to consent to overhead wires in the case of the proposed supply to Boxted Cross.

BETTER LIGHTING.—Approval has been given to a scheme for improving the lighting of the trunk road from the borough boundary at Lexden to the borough boundary on the Ipswich Road (excluding Cymbeline Way and part of Colne Bank Avenue) in accordance with the final report of the Departmental Committee on Street Lighting, at a cost of £6,350, of which £3,175 will be met by the Council out of loan. The annual maintenance cost will be £766, of which £383 will have to be met by the Council.

Consett.—ELECTRICITY IN COUNCIL HOUSES.—Council house tenants at Ebchester have voted in favour of having electricity installed in their homes.

Crook and Willington.—SUPPLY TO FACTORY.—The Urban District Council is to apply to the Electricity Commissioners for an Order to give a power supply to a new factory for the briquetting of coal at Crook.

Denny (Stirlingshire).—MAINS.—The Town Council is to lay an underground main cable at a cost of £800.

Durham. — STREET LIGHTING. — The County Council has consented to the Easington Parish Council's borrowing £2,000 for street lighting.

Eastbourne.—SUPPLY EXTENSIONS. —The Electricity Committee is to provide a supply at a cost of £2,408 to the Robin Post estate, Hailsham, where eighty houses are to be built.

Eccles. — MAINS EXTENSIONS. — The Electricity Committee is to extend mains at a cost of £3,368.

Eston.—LOAN.—Sanction is being sought by the Electricity Committee to borrow £1,000 for consumers' electrical appliances.

COOKING DEMONSTRATIONS.—The Electricity Committee is to hold electrical cooking demonstrations at Teesville from August 8th to 12th and make arrangements for similar demonstrations to be held in other parts of the urban district at later dates. The installation of breakfast cookers on hire on the Grangetown Housing Estate is to be proceeded with by the electrical engineer.

MAINS.—Extensions are to be carried out to the underground distribution network at a cost of £300.

Finchley.—REVISED CHARGES.—The Borough Council has adopted the following alterations in electricity charges, as from meter readings taken after September 1st:—Lighting flat rate, an increase from 3d. to 4d. per kWh; commercial power, existing maximum demand tariff to be withdrawn, and a tariff of 10s. per kVA per month to be substituted, with a running charge of ½d. per kWh (subject to coal clause). Consumers with 40 h.p. or over of electric motors in regular use will be permitted to take supplies for lighting at power rates, there being an alternative tariff of a flat rate of 1d. per kWh for power supplies only throughout the year.

Folkestone.—DECORATIVE LIGHTING EXTENDED.—Following a request from the Folkestone Hotel and Boarding House Association for the continuance of summer decorative lighting until the second week in October, the Town Council has instructed the borough engineer to make arrangements for it to be continued until October 9th.

Gainsborough.—LOWER CHARGES.—Mr. H. Breckell, the engineer and manager of the Electricity Department, has notified us that as from the end of June last the first 7 kWh per quarter consumed in summer and the first 15 kWh in winter per 100 W installed will be charged at 5d. per kWh instead of 6d. On the rate "C" domestic tariff the first 40 kWh per quarter will be at ½d. per kWh instead of 1½d.

Glasgow.—MAINS.—Mains are to be laid by the Electricity Committee at a cost of £10,609.

ELECTRICITY IN SCHOOLS.—The Education Committee has arranged for electrical work to be carried out by the Electricity Department at various schools at an estimated cost of £2,342.

HOSPITAL INSTALLATION.—The Health Committee has authorised the renewal of the electrical installation at Baird Street Auxiliary Hospital at an estimated cost of £650.

Grimsby.—RURAL SUPPLIES.—The Town Council is applying for consent to borrow £11,450 for transmission and distribution works in connection with the supply of electricity to the wireless transmitting station at Stenigot, and to the villages of Kenwick, Tathwell and Donnington-on-Bain.

Halifax.—ELECTRICITY EXTENSIONS.—Application is to be made by the Light, Heat and Power Committee for sanction to borrow £277,000 for extensions at the electricity works.

Hereford.—SUPPLY TO THREE ELMS.—The Corporation has approved the supply of electricity to the Three Elms district by underground cables.

Hull.—AIR RAID PRECAUTIONS.—The Air Raid Precautions Committee reports that the proposed scheme for the Electricity Department will cost £175,280, but the carrying out of the plan will be dependent upon the amount of grant received. The part of the scheme relating to the provision of a duplicate supply at a cost of £153,390 has already been submitted to the Electricity Commissioners and the Home Office for consideration.

Kettering.—THUNDERSTORM CAUSES SUPPLY FAILURES.—The most serious dislocation of supply ever experienced by the

Electricity Department occurred during a severe thunderstorm on August 4th. Nine sets of extra high voltage fuses were blown, and supplies to several districts, including East Farndon, Lubenham, Clipston, Marston Trussel, Kelmarsh, Great and Little Oxendon and Sibbertoft, were cut off from 10 p.m. until 3 a.m. on August 5th.

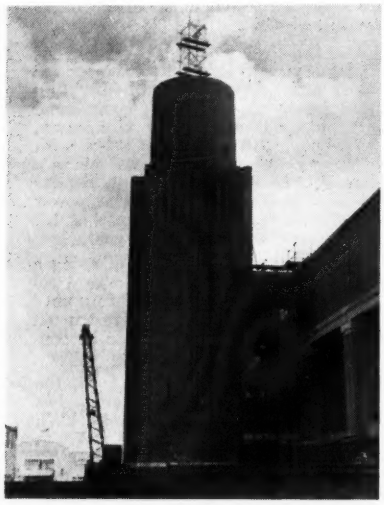
CHARTER DAY ILLUMINATIONS.—The Electricity Department has been authorised to spent £100 on illuminations as part of the celebrations on September 29th, when Kettering becomes a borough.

Leyland.—STREET LIGHTING.—Street lighting by electricity, using 150-W mercury-vapour lamps along the road from Old Cross to Farington boundary, is to be adopted by the Council. Sanction to a loan of £1,250 for the installation is to be sought.

London.—WANDSWORTH.—An interesting colour floodlighting installation has recently been completed at the County of London Electric Supply Co.'s new Central Accounts Office on East Hill, which was previously the Wandsworth Borough Council offices. The main building has been illuminated by four 150-W Holophane sodium trough floodlights arranged in the forecourt with one sodium floodlight concealed on the balcony. This gives the building a rich golden colour by night which accentuates the contrast between the stone pillars and the brick-work. The clock tower on the centre of the building has been lighted by four mercury lamps in special reflectors. On pillars each side of the gateway are two ornamental refractors equipped with gas-filled lamps to add contrast to the colour lighting, directional control keeping the light from spreading upward and so minimising the effect of the main floodlighting behind. The interior of the building is equipped with the new Holophane prismatic "Step-o-lite" fittings which give a high intensity general lighting effect, from close ceiling units. An illustration appears on page 227.

DEPTFORD.—One man was killed and another died later as the result of an explosion on August 8th at the Deptford power station of the London Power Co. The two men were assisting in dismantling a transformer when the explosion occurred.

Macclesfield.—ACQUISITION OF ELECTRICITY UNDERTAKING.—Subject to the approval of the Electricity Commissioners, the Town Council is to serve notice on the Electricity Company of Macclesfield, Ltd., of the Corporation's intention to purchase that part of the undertaking which it is entitled to acquire on August 18th, 1939, by virtue of the Macclesfield Electric Lighting Order, 1911. A special sub-committee has had under consideration the reports prepared by Mr. A. Collins, financial adviser, and Mr. L. C. Grant, consulting electrical engineer, with regard to the question. At a meeting between representatives of the Corporation and the company it was suggested that, prior to August 18th and to the service of the notice, an agreement should be reached between the company and the Corporation whereby the latter should be allowed, within three months after receipt from the company of its terms for the sale of the whole undertaking, to withdraw the notice and that the company should not make any claim by way of compensation, &c., in respect of the withdrawal. The matter is now being considered by the directors of the Electricity Company.



A view of the new chimney at Portobello power station, Edinburgh, showing the progress that has been made. The extensions to the power station will cost £100,000 and take 2½ years to complete. The 350-ft. chimney will weigh, with base, 12,000 tons

Maidstone.—ELECTRICITY FOR SCHOOL.—The Kent County Council is to enter into an agreement with the Maidstone Corporation for the supply of electricity to the new Grammar School for Girls on the Little Buckland site.

Manchester.—REVISED CHARGES.—A report recommending various adjustments in charges for electricity has been prepared by Mr. H. C. Lamb, chief engineer and manager to the Corporation Electricity Department. He expresses the view that the time is ripe for combining several of the smaller classifications and establishing new standard bases. Some users will benefit to the extent of ½d. or ¼d. per kWh. Two groups, hitherto classed as industrial power (restricted) paying 1d. per kWh, and miscellaneous small power for business purposes, charged at 1½d., are to be combined under one heading, miscellaneous small power, all receiving their supplies at 1d. Three groups, restricted industrial heating (now 1d.), cooking and heating for business premises (1½d.), and the same restricted (1d.) are all to come under industrial heating and cooking (1d. per kWh), while lighting for shop windows, after business hours (now 1½d.), is to be briefly known as shop window lighting (1d.). Domestic power and heat, without change in definition, is reduced from 1½d. to 1d. per kWh, and industrial power is to be reduced from 1½d. to 1d. per kWh. This is now almost exclusively a.c. Commenting on reasons prompting the revision, Mr. Lamb says that there will be an economy in reducing the number of meters required, and time switches will be unnecessary. The cost of the modification will be £7,500 for the period to March next, and on an annual basis approximately £14,000.

Norham (Northumberland).—LINE TO MIDDLE ORD.—The Rural District Council has approved plans by the North-Eastern Electric Supply Co. for a transmission line to Middle Ord.

Perth.—ELECTRICITY DEARER.—Users of electricity are to pay ¾d. per kWh more for lighting supplies, ½d. more for heating and ¼d. more for power.

Peru.—NEW HYDRO-ELECTRIC POWER STATION.—The Lima Light and Power Co. recently inaugurated its new hydro-electric plant at Barba Blanca on the River Santa Eulalia, about 9½ miles from Chosica. The new station has been built to contain three 17,000-h.p. units, two of which have so far been installed. It will more than double the present power supply for the city of Lima and its suburbs.

Sheffield.—REORGANISATION SCHEME.—A report presented by the manager of the Electricity Department states that £208,500 will be required for reconditioning the distribution system. He adds that the capacity of the plant has rapidly increased, and unless reorganisation takes place sub-stations and centres of distribution will become unreliable. A review of the switchgear has shown that it is becoming inadequate to deal with the possible short-circuit values. All the essential improvements, it is stated, can be completed in about three years.

REDUCTION OF CHARGES.—Reductions in electricity charges to operate from the first reading of the meters after September 1st, will be announced shortly.

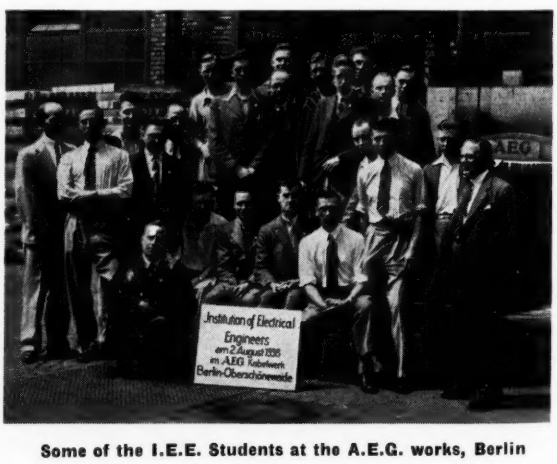
South Shields.—SUB-COMMITTEE ON TARIFFS.—A sub-committee has been appointed by the Town Council to report on tariffs for electricity.

Stalybridge. — OVERHEAD LINES. — The Corporation has granted an application from the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board for permission to place overhead lines from Huddersfield Road to Moorgate.

Stirling.—ELECTRICALLY OPERATED QUARRYING PLANT.—The County Council is to proceed with the extension of a system of quarrying stone on its own account, and new quarry plant

I.E.E. Students' Continental Tour

SIXTY-FIVE students and graduates of the Institution of Electrical Engineers returned to London on Sunday last after a tour of some of the more important Continental engineering firms. In Berlin, the welfare centres and large machine shops of the Siemens concern were inspected, whilst the A.E.G. threw its cable and switchgear shops open to the party. The temperature was the highest so far this year, and on the Wednesday the party was glad to make full use of the elaborate bathing facilities provided on the extensive waterways at Wannsee. At Essen, Krupps showed that steel can be made into ploughshares as well as swords by giving facilities for inspecting their blast furnaces, rolling mills, the largest forging press in Europe—15,000 tons capacity, locomotive shops and their extensive museum. The Philips laboratories, lamp works, assembly and machine shops at Eindhoven, Holland, provided an interesting comparison with English practice in similar work. Everywhere the members were impressed by the friendly spirit shown by the people with whom they came into contact, and by the great trouble taken to make the visits as interesting and instructive as possible.



Some of the I.E.E. Students at the A.E.G. works, Berlin

is to be installed at a cost of about £12,000. The plant will be electrically operated.

Stoke-on-Trent.—MAINS.—The Electricity Committee is to extend mains to houses on the Stoke Lodge site at Trent Vale, at a cost of £1,300, and the Health Committee proposes that a supply of electricity to the proposed new sanatorium at Hanchurch should be obtained from the electricity authority in the area. Mains and equipment for a sub-station to be erected at Ford Green, Smallthorne, will cost £2,685.

Sub-stations.—The Wolverhampton Electricity Committee is to erect a sub-station at Parkdale at a cost of £720; and Dennis Bros., Ltd., are to erect a sub-station off Hospital Road, Guildford. At Tottenham, one is to be erected in St. Ann's Road by the Ever Ready Co.; and the S.W.S. Electric Power Co. is to acquire a site for a sub-station on the Moat Farm estate, Oldbury. Application is being made by the South Shields Town Council for sanction to borrow £468, being the excess amount in connection with a new electricity sub-station at Holborn. A site near Thornton Avenue is also to be acquired by the same Council for a sub-station. The Croydon Corporation is to construct a sub-station at a cost of £620 in connection with the new destructor works, and to enlarge the Fitzjames Avenue sub-station at a cost of £3,230. Plans have been approved for a sub-station in Back Marine Avenue, Whitley Bay, for the North-Eastern Electric Supply Co., Ltd.; and the County of London Electric Supply Co., Ltd., is to construct a sub-station in Hatfield Road, Becontree. The Scrattons Farm estate is to be the site of a sub-station for the Barking Corporation; and the Grampian Electricity Supply Co. has been granted permission to erect a sub-station in Ferry Street, Montrose.

Sunderland.—ILLUMINATIONS.—The annual illuminations at Roker and Seaburn will be switched on during the next two or three weeks.

Troon (Ayrshire).—ELECTRIC STREET LIGHTING.—Following a recent experiment of lighting streets in the business parts of the town by electricity, the Town Council has decided to extend the scheme to other districts.

Turriff.—PETITION FOR ELECTRICITY.—The local Council has received a petition by seventy ratepayers in New Byth Village urging it to press a claim for electric street lighting in the village.

Wallasey.—NEW BRIGHTON ILLUMINATIONS.—The Parks Committee has approved a scheme of autumn illuminations in New Brighton from August 14th to September 30th, providing for the floodlighting of Vale Park and the Oakland Vale plantation, the provision of fairy lights along an additional section of the Promenade, and the construction of six ornamental pylons near the Promenade Pier entrance, at the total estimated cost of £900.

Wallsend.—CABLES.—Approval has been given to plans by the North-Eastern Electric Supply Co., Ltd., for underground cables between the Rosehill sub-station and a new sub-station on the Low Willington Farm Estate; and for underground cables on the Archer Street housing estate.

West Lothian.—OVERHEAD LINES.—The County Council House Committee has decided in favour of overhead lines for the electricity supply for an extensive new housing area in the southern district of the county. Underground cables would have cost £4,000 more.

Workington.—INDUSTRIAL SUPPLY.—The Electricity Committee is to provide a supply to Drummond & Co., Ltd., for industrial purposes.

NEW FEEDER.—The high-voltage feeder from Oxford Street sub-station to King Street sub-station is to be re-laid at a cost of £360.

Worthing.—SUPPLY TO NURSERIES.—The Electricity Committee has arranged terms with E. M. & A. G. Sparks for supplying electricity to new nurseries at Angmering.

METERS.—Sanction is being sought to borrow £15,000 for meters.

Walsall. — STREET LIGHTING IMPROVEMENTS. — The Public Works Committee has put forward a scheme for street lighting improvements costing £5,380, with annual maintenance charges of £1,655 and total annual charges of £2,125. A proposal that mercury-vapour electric lighting should be installed in all main roads follows a comparison between mercury-vapour and high-pressure gas lamps.

Traction

Halifax.—TRAMWAY ABANDONMENT.—The Town Council has endorsed a recommendation of the Passenger Transport Committee to abandon the tramway system at the earliest possible moment.

Hull.—TROLLEY-BUSES.—The Transport Committee is to convert the Holderness Road tram route to trolley-bus working and obtain tenders for overhead equipment and twenty trolley-vehicles.

London.—LONDON TRANSPORT DEVELOPMENT SCHEME PROGRESSES.—Work on the reconstruction of the Metropolitan and District line station at Notting Hill Gate has commenced. High speed escalators are to be provided at the Central line station, and a new ticket hall and interconnecting subways will be built.

The Ministry of Transport has granted an Order to London Transport enabling an amendment in plans to be made to allow the work of lengthening the Piccadilly station platforms to proceed immediately. One platform will now be extended in a northerly direction and the other towards the south.

London Transport, in making a special study of temperatures in the tubes, has found that they are much below surface temperatures. Furthermore, in addition to being cooler, air in the tubes is drier, is scientifically ventilated and is in constant movement. This special study is being made to assist the engineers to prepare plans for additional ventilation when heavier services begin next year as a result of the £40,000,000 extension scheme. Preliminary plans are being discussed which would cost about £500,000 and would include the installation of 30 more ventilating plants, bringing the total to more than 100. At Tottenham Court Road, on the Northern line southbound platform, a "weather maker" plant is being installed which will give an effect equivalent to melting 50 tons of ice a day on the platform. The effect will be achieved by blowing air over pipes containing water just above freezing point. The machinery should be in operation in September. At Trafalgar Square the engineers have just concluded, on a small scale, an experiment by which a belt of chilled air was created by blowing invisible water vapour across the mouth of the tunnel. The engineers are now seeing whether this device can be employed on a large scale.

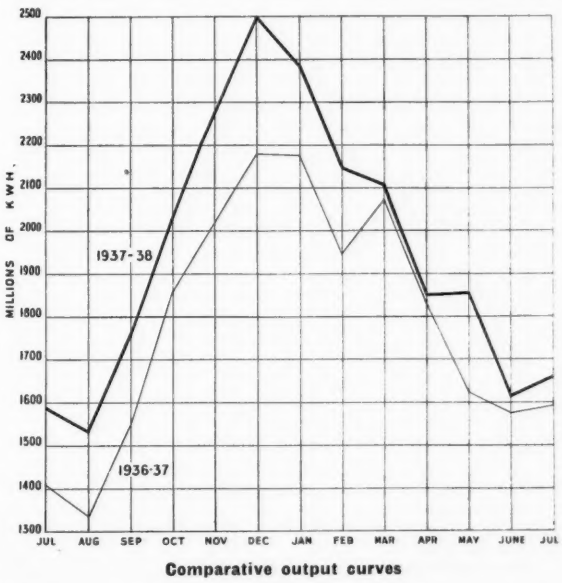
L.N.E. Railway.—BATTERY CHARGING.—Additional electrical charging points to serve the increased number of electric restaurant cars now being used in East Anglia are to be installed by the L.N.E.R. at Liverpool Street, Stratford and Ipswich, and four existing pre-heating points at Parkeston Quay are to be repositioned.

South Shields.—TRANSPORT UNDERTAKING'S PROGRESS.—An increase of 12 per cent. in the total revenue and 22 per cent. in the net profit over the previous year are shown in the recently issued annual report of the municipal transport undertaking. The conversion from tramway to trolley-bus operation continued and the stock now comprises thirty tramcars, ten trolley-buses and thirteen motor-buses. During the year 17.8 miles of trolley-wire and 452 poles were erected. Mr. H. J. Troughton, the general manager, has sent us also the following financial statistics:—Total revenue, £104,228 (£92,910 in 1937); working expenses, £74,890; net profit, £12,744; car miles, trams, 961,600, trolley-buses, 363,857; passengers carried, trams, 14,052,001, trolley-buses, 4,526,717.

Sunderland.—TRAM ROUTE EXTENSION.—The Town Council's Bill for extending its tram route in Durham Road is expected to come before Parliament in the autumn.

Generation of Electricity in July

OFFICIAL returns rendered to the Electricity Commissioners show that 1,656 million kWh was generated by authorised undertakings in Great Britain during July, as compared with the revised figure of 1,588 million kWh in the corresponding month of 1937, representing an increase of 68 million kWh, or 4.3 per cent. The number of working days in



Comparative output curves

the month (*i.e.*, excluding Sundays and Bank Holidays) was twenty-six as against twenty-seven last year.

During the seven months of 1938 up to the end of July the total amount of electricity generated by authorised undertakings was 13,609 million kWh, as compared with the revised figure of 12,811 million kWh for the corresponding period of 1937, representing an increase of 798 million kWh, or 6.2 per cent.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aireborough.—August 20th. U.D.C. Electrical installation for 156 houses on Henshaw Lane Estate, Yeadon. T. A. Lewis, Clerk of the Council, Micklefield House, Rawdon.

Aldershot.—September 6th. Electricity Department. Two 300-kVA transformers and one four-panel 6,600-V switchboard. (August 5th.)

Argentina.—September 20th. Buenos Ayres Western Railway, Ltd. Rectifier equipments for traction sub-stations. (August 5th.)

Australia.—VICTORIA.—August 30th. State Electricity Commission. Voltage regulating equipment. (T.Y. 24462/38.)*
September 6th. State Electricity Commission. 22-kV outdoor switchgear and accessories. (T.Y. 24850/38.)*

Birmingham.—August 22nd. Electric Supply Department. Railway sidings, including embankments, concrete bridges, river diversion and roads at the Hams Hall "B" power station. (July 22nd.)
October 3rd. Public Health and Maternity and Child Welfare Committee. General electrical engineering and engineering services and boiler plant in connection with extensions at Selly Oak Hospital and Infirmary. (July 29th.)

Chile.—SANTIAGO.—September 7th. Maritime Works Department. Two electric cranes for the Port of Iquique. (T.Y. 25414/38.)*

Crook and Willington.—August 26th. Electricity Department. 300-kVA transformer, 20,000-V cables and necessary switchgear. (See this issue.)

Cumberland.—County Council. Installation of electricity in a number of schools. County Architect, Carlisle.

Devon.—August 27th. County Council. X-ray equipment at the Hawkmoor sanatorium, Bovey Tracey. Clerk to the County Council, The Castle, Exeter.

Dublin.—August 31st. Electricity Supply Board. Annual supply of tools. (August 5th.)

Dundee.—August 15th. Public Health Committee. Electric lighting installation at nurses' home, Maryfield Hospital. Particulars from City quantity surveyor, 21, City Square; tenders to Town Clerk.
August 15th. Education Committee. Electric clock and bell installation at St. Mary's R.C. Girls' School, Lochee. Schedules from City quantity surveyor; tenders to Town Clerk.

Edinburgh.—September 22nd. City Council. Branch flues for Portobello power station. (August 5th.)

Eston.—September 1st. U.D.C. Steel kiosk sub-station with one 25-kVA transformer and h.v. and l.v. switchgear at North Lackenby, Grangetown. Electrical engineer, Council Offices, Grangetown-on-Tees.

Fife.—August 23rd. County Council. Electric lighting at Pittenweem Police Station, and electrical work at the Welfare Clinic, Markinch. Schedules (£1 1s. in each case) from Mr. G. Sandilands, County Master of Works, County Offices, Kirkcaldy.

Fort William.—September 7th. Electricity Department Switchgear, transformers, e.h.v. (transmission) and m.v. (distribution) systems, underground (cable) and aerial construction, e.h.v. and m.v. cable interconnection and earthing arrangements for sub-station, meters and meter-testing equipment, and changing over consumers' existing apparatus. (August 5th.)

Haslingden.—August 22nd. Town Council. Electrical work in connection with the erection of a gymnasium, nursery classroom and assembly hall. (July 29th.)

Heston & Isleworth.—August 26th. Electricity Department. One sheet steel kiosk, e.h.v. switchgear and 600-kVA transformer, 11-kV cable and pilot cable. (See this issue.)

India.—SIMLA.—September 6th. Indian Stores Department. Electricity meters for twelve months. (T. 24802/38.)*

Lanarkshire.—August 15th. Scottish Special Areas Housing Association, Ltd. Electrical work at 272, 222, and ninety-two houses. Secretary, 73a, Shandwick Place, Edinburgh, 2.

Lanchester.—Joint Hospital Board. Electrical work in connection with a new infectious diseases hospital. J. J. S. Barker, Clerk, Council Offices.

Langho (NEAR BLACKBURN).—September 1st. Committee of Management. Cinematograph installation, electric lighting fittings and water turbine pump for Brockhall Institution. (See this issue.)

London.—ISLINGTON.—September 16th. Borough Council. Three-phase e.h.v. switchgear. (July 29th.)
COMMISSIONERS OF H.M. WORKS AND PUBLIC BUILDINGS.—August 24th. Electric bell material. (August 5th.)

Manchester.—August 26th. Electricity Committee. 33-kV three-phase, outdoor a.c. switchgear. (July 29th.)

Middlesex.—August 31st. County Council. Extensions to X-ray apparatus at the Central Middlesex County Hospital. (July 29th.)

Milngavie.—August 15th. Town Council. Electrical work at Sinclair Street housing scheme. F. A. B. Preston, burgh surveyor"s office, 6, Buchanan Street (£1 1s.).

New Zealand.—WELLINGTON.—Public Works Department.
September 6th. One three-phase, 300-kVA transformer. (T. 25017/38.)*
September 20th. Two electrically driven air compressors. (T.Y. 25315/38.)*
November 1st. Remote control and metering equipment. (T. 24495/38.)* 50-kV outdoor steelwork and switchgear. (T.Y. 24300/1938.)*
November 8th. 10,000-kVA transformer bank for section 458 of the Mangahao scheme. (T. 24496/38.)*
November 15th. Indoor switchgear and control equipment for Waitaki power station. (T. 24497/38.)*
January 17th. Power and control cables for extensions at the Waitaki power station. (T. 18568/38.)*
January 24th. 110-kV outdoor switchgear and steelwork. (T.Y. 250/38.)*
September 8th. Posts and Telegraph Department. 15,840 ft. of telephone cable. (T. 25010/38.)*
September 29th. Five motor-generator sets. (T. 18565/38.)*

Peebleshire.—August 15th. Education Committee. Heating and electrical installation at new central school, Innerleithen. Reid & Forbes, 17, Great Stuart Street, Edinburgh.

Penicuik.—September 3rd. Town Council. Electric lighting at thirty-two houses at John Street. Schedules from Morham & Brotchie, F.S.I., surveyors, 29, Hanover Street, Edinburgh; tenders to Town Clerk.

Plymouth.—September 3rd. Corporation. Conversion of lifts to a.c. supply. (July 29th.)
L.v. distribution boards and underground network disconnecting boxes. (See this issue.)

Reigate.—August 31st Borough Council. Street-lighting columns, brackets and lanterns with mercury-vapour discharge lamp control equipment. (July 29th.)

Saltcoats.—August 23rd. Town Council. Electric wiring in fifty-three houses. Schedules from Hugh Thomson & Sons, architects, 60, Hamilton Street (£1 1s.); tenders to Joint Town Clerk.

South Africa.—PORT ELIZABETH.—August 25th. City Electrical Engineer's Department. Two 3,000-kVA transformers. (T. 24373/38.)*
August 25th. Five 10,000-kVA reactors, 440-yd. of 6,600-V cable and one h.v., d.c. testing and fault localising equipment. (T. 24785/1938.)*
JOHANNESBURG.—August 17th. City Council. Eleven oil-immersed circuit-breakers. (T.Y. 24691/38.)*
August 24th. One electro dynamometer. (T. 24812/38.)*
September 14th. Fourteen metalclad l.v. a.c. switchboards. T. 25412/38.)*
Public Works Department. August 25th. One 25 cu. ft. and five 6 cu. ft. electric refrigerators. (T. 25439/38.)*
PRETORIA.—September 1st. Union Tender and Supplies Board. Telephone apparatus. (T. 24816/38.)*
August 18th. Public Works Department. H.v. switchgear and transformer with l.v. switch. (T.Y. 24951/1938.)*
Electric goods lift. (T. 25263/1938.)*
August 25th. Transformer and h.v. and l.v. switchgear. (T.Y. 24950/38.)*

Southend. — August 15th. Town Council. Pumping machinery at Shoeburyness waterworks, including electric motors. Rope & Rafferty, 208, Abbey House, Victoria Street, S.W.1 (£2 2s.).

Stockton-on-Tees.—August 31st. Electricity Department. Meter-testing equipment. (August 5th.)

Stoke-on-Trent.—September 7th. Electrical Engineer's Department. Cookers, washboilers, kettles, storage water heaters and circulators. (See this issue.)

Sunderland.—August 29th. Electricity Undertaking. P.i. cables, rubber-insulated wire, meters and electric lamps for twelve months. (July 29th.)
Electric cookers, water heaters, wash-boilers and irons for three years. (August 5th.)

Thornton Cleveleys.—August 19th. U.D.C. Six 500-kVA indoor type transformers. (August 5th.)

Tottenham.—August 26th. Borough Council. Electrical stage lighting equipment for the Municipal Hall. (July 29th.)

Uruguay.—MONTEVIDEO.—September 15th. Electricity Supply and Telephones Administration. 290 reflectors and lamps. (T.Y. 24680/38.)*

Uxbridge.—August 24th. U.D.C. Two electrically operated automatic booster pumps at the water tower, Uxbridge Common. Clerk of the Council, Council Offices.

Wath-upon-Dearne.—August 27th. Installation of wiring and fittings in eighty houses and bungalows.—W. E. Haigh, Town Hall.

Wembley.—Borough Council. August 26th. Street-lighting equipment. (August 5th.)

West Ham.—September 5th. Electricity Department. V.i.r. and tough rubber-sheathed wires and cables for one year. (See this issue.)

Weymouth.—August 31st. Dorset County Council. Electrical installations in new technical school. (See this issue.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Barrow-in-Furness.—Electricity Committee. Recommended. Switchgear and transformers.—Met.-Vickers Elecl. Co. Accepted. Kiosk (£627).—Met.-Vickers Elecl. Co.

Bexhill.—Electricity Committee. Recommended. Meter test equipment (£370).—British Sangamo Co.

Birmingham.—Education Committee. Accepted. Lighting installations at (1) King's Norton Secondary School extensions (£165) and Tinkers Farm Road Council School (£659).—H. Pratt.

Blackburn.—Town Council. Accepted. Transformers for the new Royal Ordnance Factory and Crossfield sub-stations.—

G.E.C. Switchgear at these factories.—A. Reyrolle & Co. Electric passenger lift at the new offices of the Electricity Department.—Evans Lifts.

Blackpool.—Electricity Committee. Accepted. Six searchlights.—Francis & Son. Strip lighting.—Imperial Lighting Co.

Cheltenham.—Finance Committee. Accepted. Electrical work at town hall extension (£4,648).—Electrical Installations.

Chester.—Housing Committee. Recommended. Electrical installations in eighty houses on the Lache estate (£673).—W. Caton & Son.

Eastbourne.—Electricity Committee. Recommended. D.c. potentiometer (£230) and flash testing equipment (£45).—Ferranti.

Exeter.—Electricity Committee. Accepted. Fourteen transformers (£1,383).—Bonor Long & Co.

Glasgow.—Transport Committee. Accepted. Improved interior lighting at Larkfield Garage.—Siemens Electric Lamps & Supplies, Ltd. Cable.—General Cable Manufacturing Co.; St. Helens Cable Co.

Water Committee. Accepted. Electric lighting in new houses at Stronachlachar (£116).—A. Ritchie.

Harpenden (HERTS).—U.D.C. Accepted. Wiring of seventy houses on the Westfield Housing Estate (£460).—A. T. Phillips.

London.—L.C.C. Wiring and fittings for electric lighting, &c., in blocks 1 and 3 of dwellings at Will Crooks Estate, Poplar :—

	£		£
Archibald Meckhonik. Accepted	**1,639**	Ernest W. Merredew	1,778
Read and Partners	1,724	Ellis and Ward	1,779
J. H. Golding	1,729	Pemberton and Sturgess (Great	
Pinching and Walton	1,772	Britain)	1,793

Stirling.—County Council. Accepted. Electrical installation at Sheriff Court House and Police Buildings, Stirling (£667).—A. H. Muir.

Sunderland.—Town Council. Accepted. Electrical fittings and apparatus in connection with extensions to the Bede Collegiate secondary schools.—F. Reid Ferens and Co.

Surrey.—County Council. Accepted. Internal telephones at Hambledon institution (£305).—Siemens Bros.

Wallasey.—Electricity Committee. Accepted. Cables for two years.—B.I. Cables; Crompton Parkinson.

Personal and Social

Information regarding new appointments and other matters of interest for this page are welcomed

Mr. **Albert H. Bridge,** who was for many years Commercial Editor and a Director of the ELECTRICAL REVIEW, resigned from his official capacity with the journal on August 7th, having reached the retiring age of 65. He joined the editorial staff forty-seven years ago. His many friends in the industry at home and abroad will be pleased to learn that he is making a good recovery after his recent illness at his home at 60, Grange Park Avenue, N.21.

Mr. A. H. Bridge

Mr. Hugh S. Pocock, who is also a Director of the ELECTRICAL REVIEW, has been appointed Managing Editor.

Mr. J. F. Cater, Hull branch manager of the Edison Swan Electric Co., Ltd., has been elected president of the Hull Association of Engineers. Mr. Cater has been on the committee of the Association for ten years, and has held the post of vice-president. After preliminary negotiations in 1917, which, owing to the War, were dropped, the Hull Association was formed to promote the study of advanced engineering subjects by means of discussions and lectures. The membership is composed of representatives of every branch of engineering in Hull.

The following appointments of official delegates have been made to the sectional meeting of the World Power Conference, Vienna, from August 25th to September 2nd.—Appointed by the Prime Minister to represent the Government of the United Kingdom: **Sir Harold Hartley,** C.B.E., F.R.S. (chairman, International Executive Council, and chairman, British National Committee of the World Power Conference; vice-president, L.M.S. Railway Co.; chairman, Fuel Research Board, Department of Scientific and Industrial Research), and **Mr. J. M. Kennedy,** O.B.E., (deputy-chairman, Electricity Commission). Appointed by the British National Committee of the Conference: **Sir Archibald Page** (chairman, Central Electricity Board), and **Dr. F. S. Sinnatt,** C.B., F.R.S. (director of Fuel Research, Department of Scientific and Industrial Research). The Executive of the British National Committee has appointed Sir Harold Hartley to be the leader of the British Delegation to the Vienna meeting. The total attendance from the United Kingdom will exceed eighty, which is a record for any Sectional Meeting of the World Power Conference held abroad.

Mr. T. H. Aylett has been appointed southern area manager to the Lightfoot Refrigeration Co., Ltd., Wembley. Mr. Aylett was formerly with the H.M.V. Household Appliance Department of the Gramophone Company of which he was southern area manager for four years.

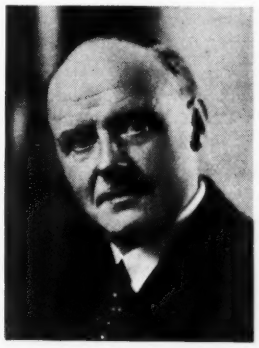
Mr. J. P. Tivey, chief engineer of the Australian General Electric Co., Ltd., has been elected president of the Electrical Manufacturers' Association of New South Wales for the coming year.

A number of appointments are announced by J. H. Tucker & Co., Ltd., following the transfer of **Mr. G. A. Ruff** from the Midlands to London as area manager:—**Mr. J. D. Harris,** as representative for East and West Midlands (transferred from Edinburgh); **Mr. L. C. Margetts,** as representative for Edinburgh and East Scotland (transferred from the Midlands where he was assistant representative); **Mr. J. Emlyn Jones,** as representative for South Wales; and **Mr. S. Dore,** of the Birmingham works staff, as assistant Midlands representative.

Mr. T. N. Riley, D.S.C., M.Sc., M.I.E.E., has resigned his position with G.V.D. Illuminators, Ltd., and is entering into practice as a consultant. Mr. Riley was formerly assistant director of research with the International Telephone and Telegraph Laboratories, Inc Communications should be sent to him at 22, The Avenue, Radlett.

Mr. J. Hutton and **Mr. W. Chalmers,** M.I.Mech.E., have been appointed to the board of J. Browett Lindley (1931), Ltd. **Mr. Hutton** has had a wide experience in the engineering industry, and has brought out many designs and inventions during his association with a number of concerns. He served an apprenticeship with Vickers, Sons & Maxim, after which he secured an appointment with Harland & Wolff, Ltd., in the marine drawing office. He later became senior draughtsman with the British Westinghouse Co., Ltd., and was afterwards placed in charge of the internal combustion engine design office. He later went to Crossley Bros., Ltd., first as leading designer and then as superintendent experimental engineer, in which capacity he played an important part in developing the range of Crossley cold-starting oil engines.

Mr. J. Hutton



Mr. W. Chalmers

In the war period he was in charge of the section building submarine, tank and trawler engines and steam turbines. After the war he returned to the Westinghouse Co. (now Metropolitan-Vickers Electrical Co.) as chief engineer of the internal combustion engine department, and was afterwards appointed mechanical standardisation engineer on large steam turbines, condensers, gears, blowers, pumps, and other plant. A member of the Vickers group at this time was Vickers-Petters, Ltd., of which Mr. Hutton became chief engineer. Since 1927 he has been chief engineer to Browett-Lindley, and for the last few years has also acted in this capacity for the associated concern of Kryn & Lahy (1928), Ltd.

Mr. Chalmers received his early training at Glasgow Technical College, and then joined Drysdale & Co., Ltd., where he became assistant to the works director, and later spent some years in Canada, studying engineering developments and improvements for the company in connection with automatic pumping and filtration plants. In 1929 he was appointed general works manager to A. G. Mumford & Co., Ltd., Colchester, and to their associated company, Kirkcaldy & Co., Ltd., Harlow, Essex. Since 1933 Mr. Chalmers has been at Letchworth, where he is general works manager of Browett-Lindley and Kryn & Lahy.

In our last issue we briefly announced that **Mr. H. F. Carpenter**, F.C.I.S., F.S.A.A., had been appointed principal officer in control of the whole undertaking of the West Midlands Joint Electricity Authority, and that **Mr. J. Morton**, M.I.E.E., M.I.Mech.E., chief assistant engineer, had been appointed chief engineer. **Mr. Carpenter** was educated at Bancroft's School, and from 1908 to 1926 (excluding war service) was with the Metropolitan Water Board. On the formation of the West Midlands J.E.A. in 1926 he was appointed

[*Miles & Kay*
Mr. H. F. Carpenter

[*Elliott & Fry*
Mr. J. Morton

secretary and treasurer, a title which was subsequently amended to clerk and treasurer. Mr. Carpenter is vice-president and past-chairma of the Council of the Birmingham and District Branch of the Chartered Institute of Secretaries, a past-chairman of the Council of the Birmingham and West Midlands Regional Group of the Institute of Public Administration, and a member of the Council of the Midlands Institute of Industrial Affairs. He is also joint honorary secretary of the Executive Committee of the Conference of Joint Electricity Authorities, Joint Advisory Boards and Joint Committees, and one of the representatives of that Conference on the Conjoint Conference of Public Utility Associations. During the war he served in Gallipoli, Egypt and Palestine.

Mr. Morton served an engineering apprenticeship with James and George Thomson, Ltd. (now John Brown, Ltd.), during which time he studied the technical side of engineering at Clydebank and Glasgow and West of Scotland Technical College. From 1900 to 1905 he was with the Cunard Steamship Co., Liverpool, obtaining a first-class Board of Trade certificate. He left the Cunard Co. in 1905 to join C. A. Parsons & Co., at their Heaton Works, and for eighteen months was in the steam turbine testing department. He next went to the Lancashire Electric Power Co., at the Ringley Road, Radcliffe, generating station, and eighteen months later joined the Construction Department of the British Thomson-Houston Co., Ltd., who were the main contractors for the Ringley Road station, and proceeded to Leeds to take charge of the erection of the vertical turbo-alternator sets for the supply of h.v. energy to the Leeds Corporation tramway sub-stations. On completion of the Leeds contract in 1907 he entered the service of the Paisley & District Tramway Co. as mains and permanent way superintendent, returning to the B.T.H. in 1911 and proceeding to Malta to take charge of the installation of the plant in connection with the wireless station installed by that company for the British Admiralty. On returning to Rugby he was appointed chief assistant in the company's Construction Department. Mr. Morton joined the Birmingham Corporation Electricity Department in 1918, where he remained until April, 1927, when he joined the West Midlands J.E.A. as transmission assistant and later becoming chief assistant engineer.

Obituary

Lt.-Col. C. B. Clay.—Many will regret greatly to learn of the death of Lieut-Colonel C. B. Clay, V.D., which occurred on August 9th. After an engineering training, he began his life's work in the United Telephone Co., in London, in 1881, two years after the first opening of telephone service in the United Kingdom. He was active in the Courts when the telephone patents owned by his company were upheld judicially; shortly after, at Sunderland, he was in charge of the Northern District Telephone Co., and he was the first to make general the use of metallic circuits, and this in a district where the competition of the Post Office was fiercest and where he won. Later he was provincial superintendent in the National Telephone Co. for all the south of England except London; his last position with the company was metropolitan superintendent which he held from 1896 until the State acquired the telephone service at the end of 1911. An extraordinarily keen sense for public service was coupled to a great loyalty to his staff; he was a great father to his people, and many hold his memory in most affectionate regard. Outside his business activities he was an enthusiastic volunteer; like his father and eldest brother he commanded the 8th Lancashire Artillery Volunteers, and at the time of his death, at the age of 82 years, he was vice-president of the National Artillery Association.—F. G.

Councillor A. Oates.—The death has occurred, at the age of forty-nine, of Councillor A. Oates, of Sheffield, who was for fifteen years an official of the E.T.U.

Mr. B. Deacon.—The death occurred recently in Melbourne of Mr. Benjamin Deacon, who went to Australia in 1898 on behalf of the British Insulated Wire Co., to form a company to electrify the Ballarat and Bendigo tramways. This company, known as the Electric Supply Company of Victoria, was managed by the deceased until his retirement in 1911.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

E. P. Thompson & Siger, Ltd.—Private company. Registered August 5th. Capital, £1,000. Objects: To carry on business as manufacturers, merchants, and patentees of domestic, industrial and mechanical appliances, &c. The first directors are: E. P. Thompson, 693, Hagley Road West, Birmingham, 32; and P. Siger, 38, Oakland Road, Monkseaton. Registered office: 229/231, Brearley Street, Birmingham, 19.

Aren (Radio & Television), Ltd.—Private company. Registered July 30th. Capital, £100. Objects: To carry on the business of manufacturers, importers, exporters, distributors and repairers of radio, television, electrical, scientific and telephone apparatus, &c. The directors are: M. Rosenthal, 53, Greenfield Avenue, Surbiton, Surrey, and W. J. Nobbs, 52, Chandos Road, N.W.2. Secretary: C. B. Grubb. Registered office: 8, Bayer Street, Aldersgate Street, E.C.1.

Trade Radio Service (Guildford), Ltd.—Private company. Registered July 30th. Capital, £100. Objects: To carry on the business of electrical, wireless, mechanical and general engineers, &c. The directors are: C. F. Hall, 25, Baden Road, Guildford, and A. C. Abbott, Little House, Wix Hill, West Horsley, Leatherhead (director of Perkins Radio Service, Ltd.). Solicitors: Triggs, Turner & Co., Guildford.

A. Chilton, Ltd.—Private company. Registered July 30th. Capital, £2,000. Objects: To acquire the business of a wireless and electrical factor carried on by A. Chilton at 17, St. John's Road, Watford. The first directors are: A. Chilton, jun., Minnie Chilton and D. W. Edwards. Registered office: 17, St. John's Road, Watford.

Allied Dynamic Industries, Ltd.—Private company. Registered July 30th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in sound film apparatus and equipment, and instruments, appliances and accessories of all kinds used or capable of being used in connection with the electrical industry. The first directors are: H. J. Matthews, 115a, Camberwell Road, S.E., and C. A. McKeand, 164, Cromwell Road, S.W.5. Registered office: 32, Monkton Street, Brook Street, S.E.11.

Returns of Electrical Companies

North-Eastern Electric Supply Co., Ltd.—Satisfaction to the further extent of (a) £15,878 5 per cent. debenture stock on July 16th, 1938, and (b) £54,645 3½ per cent. debenture stock on July 21st, 1938, of trust deeds dated October 31st, 1930, and December 30th, 1933, and registered November 8th, 1930, and January 17th, 1934, securing £2,300,000 5 per cent. consolidated debenture stock and £2,500,000 3½ per cent. consolidated debenture stock (respectively reduced to £2,270,476 and £2,395,985 by memorandum of satisfaction dated October 4th, 1937).

British Ozaphane, Ltd.—Second debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated July 15th, 1938, to secure £20,000. Holder: F. J. Chart, 4, London Wall Buildings, E.C.2.

Emerson Clark & Co., Ltd.—Mortgage on certain hire-purchase agreements dated June 28th to secure all moneys due to chargees under three agreements dated June 4th, October 25th and November 24th, 1937. Holders: Adam Finance & Industrial Corporation, Ltd., 60, Strand, W.C.2.

Lesco Trading Co., Ltd. (Old Company).—M. Hyams, 39, Cheapside, E.C.2, ceased to act as receiver and manager on July 28th, 1938.

Electrical & Household Supplies, Ltd.—R. G. Rudd, of Lyndhurst, 26, Boxmoor Road, Kenton, Middlesex, was appointed receiver and manager on July 26th, 1938, under powers contained in debenture dated May 12th, 1938.

Kent Bros. Electric Wire Co. & E. H. Phillips, Ltd.—Capital, £40,000 in 11,500 "A" ordinary 3,500 "B" ordinary and 25,000 preference shares of £1. Return dated April 22nd, 1938. 11,500 "A" ordinary, 2,300 "B" ordinary, and 25,000 preference shares taken up. £27,800 paid on 500 "A" ordinary, 2,300 "B" ordinary and 25,000 preference shares. £11,000 considered as paid on 11,000 "A" ordinary shares. Mortgages and charges, nil.

Power & Lighting Cables, Ltd.—Capital, £10,000 in £1 shares. Return dated March 30th, 1938. 1,100 shares taken up. £1,100 paid. Mortgages and charges, nil.

Electroway Heaters, Ltd.—Capital, £3,000 in £1 shares. Return dated February 11th, 1938. 2,585 shares taken up. £2,585 paid. Mortgages and charges, nil.

Globe Electrical Co., Ltd.—Capital, £3,500 in £1 shares. Return dated April 11th, 1938. 2,625 shares taken up. £2,625 paid. Mortgages and charges, nil.

Normand Electrical Co., Ltd.—Capital, £20,000 in £1 shares. Return dated January 3rd, 1938. 12,448 shares taken up. £12,448 paid. Mortgages and charges, nil.

C. A. Sothers, Ltd.—Capital, £2,500 in £1 shares. Return dated August 28th, 1937 (filed April 23rd, 1938). 1,528 shares taken up. £985 paid. £543 considered as paid. Mortgages and charges, "£1,200 issued, £1,000 paid." A further 60 shares were allotted for cash on September 9th, 1937.

W. Monks and Co., Ltd.—Capital, £1,500 in £1 shares. Return dated March 5th, 1938. All shares taken up. £750 paid. £750 considered as paid. Mortgages and charges, nil.

F. B. Hellon & Co., Ltd.—Capital, £4,000 in £1 shares. Return dated July 28th, 1937 (filed April 25th, 1938). 3,000 shares taken up. £3,000 paid. Mortgages and charges, nil.

G. D. Peters & Co., Ltd.—Satisfaction in full on July 19th, 1938, of second debenture dated December 12th, 1930, and registered December 22nd, 1930, securing £50,000.

Electric Heaters, Ltd.—Capital, £100 in £1 shares. Return dated April 25th, 1938. All shares taken up. £100 paid. Mortgages and charges nil.

Pirelli, Ltd.—Capital, £400,000 in £1 shares. Return dated February 21st, 1938. All shares taken up. £400,000 paid. Mortgages and charges: £150,000.

Cricklewood Wholesale Electric, Ltd.—Capital, £2,000 in £1 shares. Return dated February 14th, 1938. 750 shares taken up. £750 paid. Mortgages and charges nil.

Power Securities Corporation, Ltd.—Capital, £2,000,000 in 1,000,000 7 per cent. cumulative participating preference and 1,000,000 ordinary shares of £1. Return dated March 2nd, 1938. 500,000 preference and 800,000 ordinary shares taken up. £1,300,000 paid. Mortgages and charges nil.

Kidderminster & District Electric Supply Co., Ltd.—Capital, £100,000 in 5,000 preference and 5,000 ordinary shares of £10. Return dated April 11th, 1938. All shares taken up. £100,000 paid. Mortgages and charges nil.

Invincible Electrical Engineering Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 13th, 1938. 400 shares taken up. £400 paid. Mortgages and charges nil.

J. H. Holmes & Co., Ltd.—Capital, £100,000 in £1 shares. Return dated April 21st, 1938. 50,000 shares taken up. £50,000 paid. Mortgages and charges nil.

Painter Brothers, Ltd.—Capital, £40,000 in 30,000 ordinary shares of £1 and 20,000 "B" ordinary shares of 10s. Return dated April 8th, 1938. 30,000 ordinary and 12,000 "B" ordinary shares taken up. £36,000 paid. Mortgages and charges: Loan secured by debentures £27,000.

Simpson, Baker & Co., Ltd.—Capital, £20,000 in £1 shares. Return dated April 7th, 1938. All shares taken up. £20,000 paid Mortgages and charges nil.

L. Andrews & Co., Ltd.—Capital, £5,000 in £1 shares. Return dated March 21st. 2,603 shares taken up. £3 paid. £2,600 considered as paid. Mortgages and charges, nil.

Lancashire United Transport & Power Co., Ltd.—Capital, £600,000 in 300,000 5½ per cent. cumulative preference and 300,000 ordinary shares of £1. Return dated March 10th, 1938. 300,000 preference and 276,208 ordinary shares taken up. £101,306 paid. £474,902 considered as paid. Mortgages and charges, £250,000. A further £50,000 of the stock has been deposited as security for possible advances.

Hendon Electric Supply Co., Ltd.—Capital, £600,000 in 200,000 preference and 400,000 ordinary shares of £1. Return dated March 28th. All shares taken up. £347,113 paid on 200,000 preference and 147,113 ordinary shares. £252,887 considered as paid on 252,887 ordinary shares. Mortgages and charges, £172,140.

Newmarket Electric Light Co., Ltd.—Capital, £30,000 in 3,000 ordinary shares of £10. Return dated May 5th. 2,656 shares taken up. £26,560 paid. Mortgages and charges, £14,200.

Gorseinon Electric Light Co., Ltd.—Capital, £60,000 in £1 shares. Return dated March 9th. All shares issued and fully paid up. Mortgages and charges. nil.

Salisbury Electric Light & Supply Co., Ltd.—Capital, £125,000 in £1 shares. Return dated March 22nd. All shares taken up. £122,500 paid. £2,500 considered as paid. Mortgages and charges, £15,700.

South Somerset and District Electricity Co., Ltd.—Capital, £200,000 in £1 shares. Return dated March 16th, All shares taken up. £206,531 5s. paid (£1 per share, plus 2s. 4½d. premium on 55,000 shares). Mortgages and charges, nil.

E. Shipton & Co., Ltd.—Capital, £6,000 in 2,000 ordinary and 4,000 preference shares of £1. Return dated December 31st, 1937 (filed April 20th, 1938). All shares taken up. £300 paid, £5,700 considered as paid. Mortgages and charges nil.

Micanite and Insulators Co., Ltd.—The nominal capital has been increased by the addition of £60,000 in £1 shares beyond the registered capital of £140,000.

Union Lamp & Lighting Co., Ltd.—The nominal capital has been increased by the addition of £9,950 beyond the registered capital of £550. The additional capital is divided into 199,000 preference shares of 1s. each. The 1,000 deferred shares of 1s. and the above 199,000 preference shares have since been consolidated into 10,000 6 per cent. preference shares of £1 each.

Ace Electric Accessories, Ltd.—The nominal capital has been increased by the addition of £5,000 beyond the registered capital of £6,000. The additional capital is divided into 3,000 7 per cent. non-cumulative redeemable preference shares of £1 and 40,000 ordinary shares of 1s.

Boston and District Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £40,000 in £1 ordinary shares beyond the registered capital of £170,000. The Electrical Finance and Securities Co., Ltd., holds practically the whole of the shares.

Colne Valley Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £160,000 in £1 ordinary shares beyond the registered capital of £190,000. The Electrical Finance and Securities Co., Ltd., holds practically all the issued shares.

Northwood Electric Light and Power Co., Ltd.—The nominal capital has been increased by the addition of £140,000, in £1 ordinary shares, beyond the registered capital of £140,000. The bulk of the ordinary shares are held by the Electrical Finance and Securities Co., Ltd.

City Notes

Falk, Stadelmann & Co., Ltd.—Presiding at the recent annual meeting Mr. Max Falk (chairman) said that while at the beginning of the year under review there was evidence of continued improvement in trading, unfortunately they did not escape the effects of the trade recession which set in generally during the latter months of 1937. They had, however, fully maintained their position as compared with the previous year, subject to the additional taxation in the form of N.D.C. In the electrical supplies section their business had been strengthened by the further development of manufacturing facilities for specialised types of apparatus. All the various departments of their business had satisfactorily contributed to the trading results shown. Their distributing branches and depôts in the United Kingdom and overseas had in general shown satisfactory progress. The volume of business had been well sustained, particularly in the case of their subsidiary in the Union of South Africa. The opening of the current trading year had not been auspicious, turnover having suffered a setback, in common with industry in general, as compared with the corresponding period of the previous year. There were signs, however, of improvement in the economic and political outlook which encouraged him to believe that a recovery was in sight and they were well placed to secure a full share of a betterment in trade.

The Cables Investment Trust, Ltd., reports an income from investments for the year ended June 30th of £369,556, an increase of £13,313 as compared with the previous year, and a net revenue of £240,841, an increase of £11,492, to which is added £17,633 brought in, making £258,474. The ordinary dividend for the year is maintained at 5 per cent. by the final payment of 3 per cent., and £68,474 is carried forward.

The Pennsylvania Water & Power Co. reports a gross revenue for the six months to June 30th of $3,556,028, as compared with $3,181,856 in the corresponding period of 1937, and a net revenue of $1,788,047 (against $1,740,403). A dividend of $1 per share on the common shares is declared for the quarter ending September 30th (same).

Gabriel, Wade & English report trading profits, including investment income, of £102,912 for the year ended May 31st, a decrease of £33,790, as compared with the preceding year, and a net balance, before meeting tax, of £90,987 (against £126,405). Income tax and N.D.C. absorb £16,813 and the dividend for the year is maintained at 8 per cent., including 2 per cent. bonus. Reserve receives £30,000 and £42,874 is carried forward (against £41,430 brought in).

The Britannia Electric Lamp Works, Ltd., held its first annual meeting on August 8th, when Mr. J. Ismay (chairman), who presided, said that production at the factories at Acton and Wembley was proceeding according to plan and output was rapidly increasing. Their business in electrical accessories was expanding and a subsidiary company had been formed to deal with this side of their activities.

The Farnham Gas and Electricity Co. is maintaining its interim dividend at 3 per cent. less tax.

The Greengate and Irwell Rubber Co. is maintaining its interim dividend at 4$\frac{1}{6}$ per cent., less tax.

Stocks and Shares

TUESDAY EVENING.

THE trend of investment markets in the Stock Exchange continues to indicate that there is plenty of money awaiting employment. Notwithstanding the seasonal influences, new issues of good class that offer security at a reasonable figure are assured of favourable consideration. Markets are, of course, considerably affected by the holiday feeling, and the latest factor making for restraint of business is uncertainty as to the outcome of the friction between Russia and Japan. It may be argued that whatever happens in Manchuria cannot possibly have any bearing upon quotations for stocks and shares as a whole, but previous references to the sympathy which links one market with another will have made it clear that any international event of major importance exercises a very widely spread effect.

Mild speculation is revived in Crompton Parkinsons and Callenders. The American situation continues to control sentiment to a larger extent than would be the case were general Stock Exchange business to be active. The trade position appears to be improving in the United States. This acts as a bullish factor in a position which still contains a good many elements of uncertainty.

Electricity Supply Market

Scarcely a ripple disturbs the level of prices for Home electricity supply shares, from which investment is prepared to accept the relatively modest yield of about 4¼ per cent. in return for the stability and safety which the industry offers. Legislation for the industry's reorganisation has come to be considered in the market as a somewhat hazy prospect. Many people would be in no way surprised to see yet another session

of Parliament pass away with no progress in the matter having been made. This view takes into consideration the fullness with which the Government's hands are occupied, and, also, recent experience in connection with the Coal Bill. The latter involved some of the same principles—compulsory amalgamations, for instance—as would arise in the electricity scheme. Victoria Falls shares continue to attract attention among the overseas light and power undertakings. A further $\frac{1}{16}$ advance this week has lifted the price to 75s. Palestine Electric "A" shares, at 30s. 6d., and Jerusalem Electrics, at 26s., are noticeably better on the evidence that the industry continues to progress in the face of the disturbances. Arabs and Jews seem to confine their animosity, at present, to attacks on persons rather than on property.

Equipment and Manufacturing

Callender's Cables and Crompton Parkinsons have again monopolised the bulk of the business passing in the market for electrical equipment shares. Both prices have lost ground, falls having occurred of $\frac{1}{16}$, to 5, in Callenders, and of $\frac{1}{4}$, to 27s. 6d., in Cromptons. Approval is expressed of the companies' action in setting rumour at rest by announcing negotiations to be in train for a linking-up of their activities and impatience for the details is regarded as hardly justified. Due recognition is given to the complexities involved in arriving at a partnership basis satisfactory to the proprietors of concerns having such widely different characteristics. English Electrics, at 31s., are a few pence lower, and there have been small declines in Crabtree Electrical, to 25s. 3d., and Hall Telephones, to 20s. Improvements of $\frac{1}{16}$ are shown by Telegraph Constructions, at 2$\frac{1}{8}$, Electric Constructions, at 33s. 9d., and Ericssons, at 40s. These recoveries owed something to the good showing made by the electrical manufacturing trades in the July unemployment figures.

Enfield Cable Dividends

The interim dividend of 6$\frac{1}{4}$ per cent. declared recently by the Enfield Cables company was at the rate generally expected. After a few days' flurry last March, at the time of the 60 per cent. capital bonus decision, it was recognised that dividends would in all probability be scaled down in proportion to the increase in capital. The new rate is exactly equivalent, from the shareholders' standpoint, to last year's 10 per cent. interim payment. On the same basis, the final dividend would be 9$\frac{3}{8}$ per cent., making a total of 15$\frac{5}{8}$ per cent. for the year. At this rate the yield on the ordinary shares, standing now at 2$\frac{1}{2}$, would be 6$\frac{1}{4}$ per cent.

Recent Issues

During the past month or two a number of industrial companies have taken advantage of the more confident feeling in the markets to raise fresh capital. Equities being still regarded with some caution, the new offers have mostly taken the shape of debentures, or preference shares. Trustee issues, also, have been appearing in the gilt-edged market. The hot-weather season is likely to dry up the stream for the time being. The South Metropolitan Electric Company's new stocks are changing hands at around the prospectus prices, which were 20s. 6d. in the case of the 4 per cent. third preference shares, and 100 for the 3$\frac{1}{2}$ per cent. debentures. Midland Counties Electric 3$\frac{1}{2}$ per cent. debenture stock, offered at par, is at a small discount, and the similar stock issued at 99 by B. C. & H. Power stands at the price of the offer.

Traction and Transport

Latest traffic receipts published by the main-line railways have done nothing to help the market to its feet after the blow administered by the companies' half-yearly profits and dividends. Prices reflect considerable concern at the trend of the weekly traffic figures, which, as a barometer to the state of trade throughout the country, naturally carry weight in many sections of the House besides the Home railway market. Elsewhere, British Electric Tractions have shed 25 points, to 1000; Tillings are on the dull side, at 45s. 6d.; and Bristol Tramways have sagged from 44s. 6d. to 43s. 9d. Birmingham & District Trusts, at 38s. 9d., are 1s. 9d. better. In the South American group, Anglo-Argentine Tramway first preference have fallen to 5s., which is the same price as the second. Brazilian Tractions are slightly reactionary at 13.

Miscellaneous Matters

London stock markets can no longer properly complain of lack of encouragement from Wall Street. Having raced far ahead of the actual improvement in business, however, American prices have shown for a week or more a disposition to wait for the latter to catch up to some extent. Not altogether satisfied apparently, with the rate at which industrial activity is following the trail indicated for it by the stock-market advance, Wall Street remains in an undecided frame of mind. Judging by the news expressed over here, London also has doubts as to whether the business news and prospects give sufficient warranty for as much bullishness as has been displayed. Utility stocks continue relatively to hang fire owing to the weight with which the hand of the New Deal presses on the companies' industries. While American "Tel. and Tel.," at 144$\frac{1}{4}$, and Western Unions, at 31$\frac{1}{4}$, are unchanged on the week, International Telephones are a shade lower, at 9$\frac{3}{8}$. Of the British communication stocks, Cable and Wireless ordinary, at 53, and the preference, at 98, are each a point lower.

Share List of Electrical Companies

Home Electricity Companies.

	Dividend. Nom.	Previous.	Last.	Price Aug. 9.	Rise or Fall.	Yield £	p.c. s.	d.
Bournemouth and Poole	1	15	15	66/3	—	4	10	7
City of London	1	7½	7½	33/6	—	4	9	7
Clyde Valley	1	7	8	38/–	+6d.	4	4	3
County of London	1	10½	10½	49/6	—	4	4	7
Edmundson's 7% Pref.	1	7	7	32/6	—	4	7	6
Do. Ord.	1	8	9	27/6	—		—	
Elec. Dis. Yorkshire	1	9	9	42/6	—	4	4	9
Elec. Fin. and Securities	1	12½	12½	50/–	—	5	0	0
Elec. Supply Corporation	1	11	12	53/9	—	4	9	5
Lancs Light and Power	1	7½	7½	32/–	—	4	13	9
Lond. Assoc. Electric	1	—	7	30/–	—	4	13	4
London Electric	1	8	7	35/6xd.	+6d.	3	19	0
London Power Deb. Red.	Stock	5	5	106½	—	4	14	0
Metropolitan	1	10	12	50/-xd.	+6d.	4	16	0
Midland Counties	1	7½	8	38/–	—	4	4	3
Mid. Elec. Power	1	8	9	40/9	—	4	8	3
North Eastern Electric Ordinary	1	7	7	33/–	—	4	4	10
Do. 7% Pref.	1	7	7	33/–	—	4	4	10
Northampton	1	10	10	46/3xd.	+9d.	4	6	7
Notting Hill 6% Pref.	10	6	6	14	—	4	5	9
North Met. Elec. Ordinary	1	10	10	48/9	—	4	2	0
Do. do. 6% Pref.	1	6	6	29/6	—	4	1	4
Scottish Power	1	8	8	38/–	—	4	4	3
South London	1	7	7	32/–	—	4	7	6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	18/9	—	8	0	0
Yorkshire Elec.	1	8	8	41/-xd.	+6d.	3	18	1

Public Boards.

Central Electricity, 1950–70	Stock	5	5	113	—	4	8	6
Do. 1955–75	,,	5	5	116½	—	4	5	10
Do. 1951–73	,,	4½	4½	109	—	4	2	7
Do. 1963–93	,,	—	3½	100½	—	3	9	8
London Elec. Trans. Gtd.	,,	—	2½	92	—	2	14	4
London & Home Counties, 1955–75	,,	4½	4½	112½	—	4	0	0
London Passenger Transport, A	,,	—	4½	118½	—	3	16	9
Do. do. B	,,	—	5	119½	—	4	3	8
Do. do. C	,,	4	4½	74	—	5	14	10
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4	9	3

Telegraph and Telephone.

American Tel. & Tel.	$160	9	9	144¼	—	6	4	7
Anglo-Am. Tel. Pref.	Stock	6	6	109xd.	+½	5	10	1
Do. Def.	,,	1½	1½	26	—	5	15	5
Cable & Wireless 5½% Pref.	,,	4½	5½	98	—1	5	12	1
Do. Ord.	,,	—	4	53	—1	7	11	0
Do. Income	,,	—	—	102	—	3	18	2
Globe Tel. & Tel. Ord.	1	5½*	7½*	32/–	—	4	13	9
Do. do. Pref.	1	6	6	27/–	—	4	9	0
Great Northern Tel.	10	20	20	38	—	5	5	8
Marconi-Marine	1	10	7½	27/6	—	5	9	1
Oriental Telephone Ord.	1	12*	12*	58/9	—	4	1	8

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/–	—$\frac{1}{16}$		—	
Do. do. 2nd Pref.	5	Nil	Nil	5/–	—		—	
Do. do. 5% Deb.	Stock	Nil	Nil	12	—1		—	
British Electric Traction Def. Ord.	,,	5	5	1000	—25		—	
Do. do. Pref. Ord.	,,	8	8	170	—	4	14	2
Brazil Traction	$100	70 cts.	$1	13	—$\frac{1}{8}$		—	
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	100	—	5	0	0
Mexican Light Common	$100	Nil	Nil	1	—		—	
Do. do. 1st Bonds	$500	5	5	20½	—		—	
Victoria Falls Ord.	1	12	13½	75/–	—	3	12	0
West Riding	1	6½	10	35/–	—		—	

Manufacturing Companies.

Aron Electricity Ord.	1	15	15	1⅝	—	9	4	8
Assoc. Elec. Ord.	1	10	10	39/–	—	5	2	7
Do. Pref.	1	8	8	37/–	+6d.	4	6	6
Babcock & Wilcox	1	10	10	38/9	—	5	3	0
British Aluminium Ord.	1	10	12½	49/6	—	5	1	0
British Insulated Ord.	1	20	20	44	—	4	6	6
Brush Ord.	5/–	Nil	Nil	5/3	—		—	
Callenders'	1	20	20	5	—$\frac{1}{16}$	4	0	0
Do. 6½% Pref.	1	6½	6½	31/3	—	4	2	4
Crompton Parkinson Ord.	5/–	12½	12½	27/6	—$\frac{1}{4}$		—	
Do. 8% Pref.	1	8	8	37/6	—	4	5	4
Electric Construction	1	10	12½	33/9	+$\frac{1}{16}$	7	8	0
Enfield Cable Ord.	1	25	25	2½xd.	+1/–		—	
English Electric	1	Nil	10	31/–	—6d.	6	9	0
Do. do. Pref.	1	6½	6½	26/–	—	5	0	0
Ericsson Tel.	5/–	25	25	2	+$\frac{1}{16}$	3	2	6
Ever Ready	5/–	45	35	20/–	—	8	15	0
Ferranti Pref.	1	7	7	27/6	—	5	2	0
G.E.C. Pref.	1	6½	6½	32/6	—	4	0	0
Do. Ord.	1	17½	20	77/6	—	5	3	0
Henley's	5/–	15	20	21/3	—	4	14	1
Do. 4½% Pref.	1	4½	4½	21/3xd.	+6d.	4	4	8
India-Rubber Pref.	1	5½	5½	21/3	—	5	3	6
Johnson & Phillips	1	10	12½	38/9	—	6	8	10
Lancashire Dynamo	1	20	25	3	—	8	6	8
Siemens Ord.	1	7½	7½	25/–	—	6	0	0
Telegraph Construction	£1	7½	10	2⅛	+$\frac{1}{16}$	4	14	0

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

27498. "Measurement of small electromotive forces and the automatic control of variable physical properties giving rise to the same." A. B. Stevenson, T. C. Alcock, and Imperial Chemical Industries, Ltd. October 9th, 1936. (488706.)

27995. "Electric micro-balance for weighing and other purposes." R. Munro and J. M. L. Morton. October 15th, 1936. (Cognate application 7478/37.) (488921.)

30503. "Television transmission tubes." Radioakt.-Ges. D. S. Loewe. November 9th, 1935. (488644.)

30532. "Electric valve circuits." British Thomson-Houston Co., Ltd. November 8th, 1935. (488851.)

30693. "Apparatus for detecting faults in oscillatory-current circuits." R. Willoughby. November 10th, 1936. (488645.)

33946. "Supply arrangements for cathode-ray tubes." E. W. Bull. December 10th, 1936. (488655.)

34090. "Electric circuit controllers." British Thomson-Houston Co., Ltd. December 11th, 1935. (488658.)

1937

492. "Wire for electric welding." Bohler & Co. Akt.-Ges., Geb., and F. Leitner. January 7th, 1937. (488991.)

850. "Photoelectric cell and amplifier circuits." Western Electric Co., Ltd. (Electrical Research Products, Inc.) January 11th, 1937. (488859.)

971. "Sealing of electrical conductors into envelopes of quartz or the like." Scophony, Ltd., and H. P. Barasch. January 12th, 1937. (488993.)

976. "Electric condensers." Standard Telephones & Cables, Ltd., J. A. Leno, and J. C. Edwards. January 12th, 1937. (488713.)

1050. "Supersonic heterodyne receivers." Murphy Radio, Ltd., and D. N. Truscott. January 13th, 1937. (488717.)

1058. "Traffic-control systems." Automatic Telephone & Electric Co., Ltd., J. H. Taylor, G. W. Thompson, and A. P. B. Renshaw. January 13th, 1937. (488796.)

1071. "Electron multipliers working as oscillators or amplifiers." Farnsworth Television, Inc. February 24th, 1936. (488661.)

1227. "Magneto or other electric current interrupters." R. Bosch Akt.-Ges. January 18th, 1936. (488930.)

1258. "Internal-combustion engine-electric power units." Sulzer Freres Soc. Anon. February 26th, 1936. (488931.)

1301. "Electron discharge valves." C. Lorenz Akt-Ges. January 16th, 1936. (488870.)

1302. "Electric remote indication systems." Standard Telephones & Cables, Ltd., E. M. S. McWhirter, and H. J. Ward. January 15th, 1937. (489000.)

1352. "Coated electrodes for electric arc welding." Elektriska Svetsnings Aktiebolaget. January 17th, 1936. (488871.)

1393. "Temperature-responsive devices." W. J. G. Cosgrave and Electric Resistance Furnace Co., Ltd. January 16th, 1937. (489005.)

1453. "Concentric electric conductors." Fujikura Electric Cable Works, Ltd., and M. Maki. January 18th, 1937. (489007.)

1470. "Electric heating elements." L. Kellner, M. Kellner, and V. Gebert. January 18th, 1937. (488947.)

1476. "Grid control of cathode-ray tubes." Radio Akt.-Ges. D. S. Loewe. January 20th, 1936. (488948.)

1489. "Electric control systems." Westinghouse Electric & Manufacturing Co. January 16th, 1936. (488950.)

1744. "Apparatus for rectifying electric currents." L. W. Bamford. January 20th, 1937. (488872.)

2002. "Signalling systems for giving signal indications on trains controlled magnetically from the track, and vice versa." Vereinigte Eisenbahn-Signal-Werke Ges. February 4th, 1936. (488724.)

2561. "Motor generator sets." G. H. Fletcher and Metropolitan-Vickers Electrical Co. Ltd. January 28th, 1937. (488727.)

2935. "Thermionic cathodes and discharge devices employing them." M. O. Valve Co., Ltd., M. Benjamin, and R. O. Jenkins. February 1st, 1937. (488873.)

3118. "Thermally operated electric switches." Santon, Ltd., and H. C. Sanders. February 3rd, 1937. (488729.)

4285. "Permanent-magnet structures." N. Ryder, S. J. Eidsforth, and Metropolitan-Vickers Electrical Co., Ltd. February 12th, 1937. (488875.)

5043. "Electric incandescent lamps and discharge devices having hermetically sealed vessels." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Gluhlampen). February 19th, 1937. (Cognate application, 16755/37.) (488877.)

5841. "Electric convertors." General Electric Co., Ltd., and D. H. Donaldson. February 26th, 1937. (488736.)

6379. "Tables for use in X-ray therapy." J. Van Roojen and Schall & Son, Ltd. March 3rd, 1937. (488880.)

8653. "Machines for producing stranded conductors." British Insulated Cables, Ltd., and J. L. Packer. March 24th, 1937. (488739.)

8892. "Shielded electric cable system." Standard Telephones & Cables, Ltd. April 14th, 1936. (488741.)

8913. "Apparatus for the remote detection or location of radiators of infra-red rays." R. Wood and F. W. Hawkridge. March 25th, 1937. (488882.)

10768. "Electric cable." Southern United Telephone Cables, Ltd., W. P. Whitehouse, and A. T. C. Moore. April 15th, 1937. (488885.)

12982. "Device for rectifying alternating current comprising an ionic discharge tube." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 7th, 1936. (488886.)

14646. "Ultra high-frequency electron-discharge arrangements." Telefunken Ges. für Drahtlose Telegraphie. May 26th, 1936. (Addition to 477668.) (488747.)

18788. "Apparatus for taking X-ray pictures of parts of the human body." S. Strauss and L. Weisglass. July 8th, 1936. (Cognate application, 18789/37.) (488892.)

19203. "Stands for electric pressing-irons." L. Polo. July 10th, 1937. (Convention date not granted.) (488756.)

20755. "Conversation booths or telephone and like cabinets." C. F. Burgess Laboratories, Inc. July 31st, 1936. (488970.)

20934. "Dental X-ray film packages." J. W. Frankel. August 14th, 1936. (488677.)

21372. "Electric resistance welding machine." American Chain & Cable Co., Inc. August 22nd, 1936. (488895.)

22217. "Suppressing mirror frequencies in heterodyne radio receivers." C. Lorenz Akt.-Ges. August 12th, 1936. (488898.)

23705. "Directly heated oxide-coated cathodes for electric discharge devices." Siemens & Halske Akt.-Ges. August 31st, 1936. (488899.)

24008. "Photo-electric cells." Klangfilm Ges. and K. Schwarz. September 2nd 1937. (488766.)

28377. "Secondary electron-emitting electrodes." Soc. Francaise Radio-Electrique. October 23rd, 1936. (488688.)

28707. "Screening means for electric signalling cables." Felten & Guilleaume Carlswerk Akt.-Ges. November 26th, 1936. (488777.)

28736. "Method of, and apparatus for, receiving and indicating radiant energy." H. V. Hayes. October 31st, 1936. (488778.)

28876. "Electromagnetic interrupters." British N.S.F. Co., Ltd. (Nurnberger Schraubenfabrik und Facondreherei). October 22nd 1937. (488779.)

29531. "Electron-discharge device oscillators." Marconi's Wireless Telegraph Co., Ltd. December 24th, 1936. (488817.)

29978. "Electric wave filters." C. Lorenz Akt.-Ges. November 3rd 1936 (488978.)

31463. "Radio direction-finder." J. I. Heller. November 16th, 1937. (488823.)

31890. "Networks for interconnecting a two-wire transmission line with a frequency source." Standard Telephones and Cables, Ltd. November 19th, 1936. (488912.)

31917. "Electric heating cushions." J. Bartik. November 20th, 1936. (488826.)

32248. "Navigation-aiding radio systems." Telefunken Ges. für Drahtlose Telegraphie. November 23rd, 1936. (488827.)

33865. "Air- or gas-cooled electrical apparatus, such as transformers and condensers." Siemens-Schuckertwerke Akt. -Ges. December 7th, 1936. (488980)

35046. "Electron-discharge apparatus." Standard Telephones and Cables, Ltd. January 6th, 1937. (488695.)

1938

1780. "Electrical temperature-responsive units." General Motors Corporation. August 26th, 1937. (488838.)

4237. "Circuit arrangements for the production of periodical potential pulses." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 13th, 1937. (488842.)

6989. "Television receivers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 8th, 1937. (488843.)

9448. "Variable electric condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 30th, 1937. (488845.)

9452. "Devices of the kind comprising at least two parallel-connected electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 30th, 1937. (488846.)

15324. "Electron-optical systems." Marconi's Wireless Telegraph Co., Ltd. November 30th, 1937. (Divided out of 32798/36 and 32800/36.) (488920.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month of August 3rd :—

Fernicube. No. 585896. Class 5. Unwrought and partly wrought metals used in manufactures. No. 585897. All goods in Class 8.—Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.

L.T.P. (lettering and design). No. 580168. Class 8. Electric transformers, chokes and coils.—London Transformer Products, Ltd., L.T.P. Works, Cobbold Road, Willesden, N.W.10.

Vibrokav. No. 582677. Resotank. No. 582678. Class 8. Electric discharge valves (not for medical purposes), radiotelephonic and telegraphic transmitting and receiving apparatus, television transmitting and receiving apparatus, instruments and apparatus for the transmission and reception of signals and pictures, and parts of such instruments and apparatus. Resotank. No. 585304. Class 11. Electric discharge lamps, ultra-short-wave electric generators (not being machines), and diathermic apparatus.—Julius Pintsch Gesellschaft, Berlin (British representatives, G. F. Redfern & Co., 15, South Street, E.C.2).

Skipper. No. 586020. Class 8. Radio telegraphic and telephonic apparatus, and television apparatus.—A.R.T., Ltd., 53, Farringdon Road, E.C.1.

An Under-water Power Station

GERMANY opened the first under-water hydro-electric power station in Pomerania about two years ago. Meanwhile, as we recently reported, a further under-water plant has been put into operation near Augsburg in the river Iller. German papers remark on the importance of the under-water construction in view of national defence. By placing the turbines in the water and thus doing away with the machine house, barrage and canal for shipping, considerable saving in material and time of construction has been effected. In Germany's first under-water power station, so-called Arno Fischer horizontal type turbines were built into the weir in the direction of the flow. The new station *in* the Iller (near Steinbach) in Bavaria consists of four turbines rated at 10,000 h.p. The generators are built into the pipes through which the water flows, and their spokes are formed as blades.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aireborough.—Electrical installation for houses, Henshaw Lane, Yeadon; surveyor, Micklefield House, Rawdon.

Billingham-on-Tees.—Houses (396), near Wolviston Road; U.D.C. surveyor.

Birmingham.—Six shops and houses, Lyndon Road, Sheldon, for J. Kelly, 380, Stratford Road, Birmingham. Additions to the Woodlands Hospital (£15,000), with electrical work; R. Fenwick, Ltd., builders, Charles Henry Street.

Blackpool.—Houses (100), Layton; borough engineer. Houses (12), Normandie Avenue; T. Foster. Houses (38), Quermore Avenue; Boardman & Co.

Bolton.—Houses (16), Sunnyside Road; A. T. Reynolds & Co., Ltd. Gymnasium, Castle Hill school (£7,186); borough engineer. Extensions to St. Edmund's school, Eastbourne Grove and school; R.C. trustees. Extensions to works, Turner Bridge; Thomas Ryder & Son, Ltd.

Bucknall (STAFFORDSHIRE).—Houses (302), Townsend; C. Cornes & Son, Hanley.

Bursiem.—Houses (154), near Waterloo Road; C. L. D. Bates.

Buxton.—Extensions to Devonshire Hospital (£35,000); T. Worthington & Sons, architects, Oxford Road, Manchester.

Cheltenham.—Extensions to Town Hall (£72,581); Collins and Godfrey.

Chester.—Houses (100), Blacon; C. J. Curtis & Co. School, Blacon (£11,341); E. J. B. Gould, Ltd.

Chippenham.—Cinema, Marshfield Road; W. H. Watkins, architect, Sun Buildings, Clare Street, Bristol.

Consett (Co. DURHAM).—Houses (178), and community centre; J. J. Eltringham, architect, Derwent Street, Blackhill.

Corby.—Cinema, High Street, for B. J. Wilson.

Cornhill (NORTHUMBERLAND).—School (£16,700); W. W. Tasker, County Hall, Newcastle-on-Tyne.

Coventry.—School, Alderman's Green Lane, for the trustees and managers of the Coventry Bluecoat School; G. A. Steane, architect, 5, Queen Victoria Road.

Cranbrook (KENT).—Houses (62), for R.D.C.; F. O. Marchant, architect, 63, Vicarage Road, Eastbourne.

Crawley (SUSSEX).—Hospital, Crawley Rectory site, for Cottage Hospital Executive Committee; secretary.

Crook (Co. DURHAM).—Houses (50); Weatherell, Dent and Pickersgill, architects, Lloyds Bank Chambers, Barnard Castle.

Driffield.—Houses (40), Kilham, Kirkburn, Nafferton, North Frodingham and Middleton; F. Vaux, Council's architect, Danesmoor Chambers, 29, Quay Road, Bridlington.

Eccles.—Houses (57), Alder Forest; Bridgewater Estates, Ltd. Houses (32), School Street, Winton; Broomfield & Co.

Edinburgh.—Flats (28), Osborne Terrace; T. Bowhill Gibson, architect. School, East Pilton Recreation Ground, for the Corporation; city architect.

Egham.—Extensions to Strode's School (£6,424); Governors.

Eltham.—Houses (153), Allenswood Road; R. C. Hammett, The Broadway, Bexley Heath.

Enfield.—Houses (32), near Lancaster Road; Vigers & Co.

Epsom.—School of art, and museum, back of Heathcote Street (£35,000); U.D.C. surveyor.

Exeter.—Baths, Heavitree Road (£40,224); F. & E. Small, Taunton.

Fenton (STAFFORDSHIRE).—Houses (40), Vivian Road; C. Cornes & Son, Hanley.

Gateshead.—Library, Redheugh, for the T.C. (£5,128); J. Sutton & Son, builders, Tinn Street.

Glasgow.—School, Whitehill (£178,000) and extensions to St. Columba's School (£84,250), for the Education director.

Gosforth (NORTHUMBERLAND).—Stadium for a syndicate (£200,000); Arthur and Kirkup, architects, 13, Swinburne Street, Gateshead.

Hexham-on-Tyne.—Maternity and child welfare centre (£3,200); W. W. Tasker, county architect, County Hall, Newcastle-on-Tyne.

Holywell.—Cinema, Bagillt Street, for a local syndicate; Ernest Ogden & Co., architects, 1, Ridgefield, Manchester.

Horsham.—Houses (102); R.D.C. surveyor.

Hull.—School, Clough Road (£31,150); Newland C.E. Managers.

Kent.—Extensions to Institution, Orpington (£17,000); county architect.

Kettering.—Houses (100), Avondale estate, for the U.D.C.; Campion, Ltd., contractors, Gresham House, Dogsthorpe Road, Peterborough.

Leeds.—College of art, commerce and technology (£260,000), for the E.C.; borough surveyor.

Leith.—Cinema for Leith Cinema Co., Ltd.; James Miller & Partners, Ltd., builders.

Liverpool.—Chemical laboratories, Brownlow Street, for the University; Barnish, Silcock & Thearle, architects, 58, Rodney Street.

Longton (STAFFORDSHIRE).—Development of (42 acres) Meir Hay; Adams & Edwards, architects.

Lynemouth (NORTHUMBERLAND).—School (£29,960); W. W. Tasker, County Hall, Newcastle-on-Tyne.

Manchester.—Houses (24), New Bank Street, Bowmeadow Grange, &c., Longsight; Booth & Sons, architects, 1, Eileen Grove, Rusholme. Houses, Parkfield Road, New Moston and Hawthorn estate, Hawthorn Road, New Moston; J. Saxon, builder, 27, Brooklands Road, Crumpsall. Showrooms, Deansgate, St. Mary's Street, King Street West and Southgate, for Kendal Milne & Co. (Harrods, Ltd.), Deansgate; J. W. Beaumont & Sons, architects, 53, Spring Gardens, Manchester.

Middlestone Moor (DURHAM).—Houses (44), for North Eastern Housing Association, Metrovick House, Newcastle-on-Tyne; G. H. Gray, architect, 50, Camden Street, North Shields.

Motherwell.—Houses (306), for T.C.; burgh surveyor.

Newbury.—Cinema, Parkway (£20,000); Berney & Marks, Ltd.

Newcastle (STAFFORDSHIRE).—Works buildings, Knutton; T. Jervis Madew, architect, 1, King Street.

Newcastle-on-Tyne.—Houses (14), for Haddon and Hillman, Huddleston Street; F. M. Dryden, architect, New Market Street. Alterations and extensions to restaurant, &c., Oxford Galleries Dance Hall; T. Clements and Son, contractors, Selborne Gardens.

Northallerton.—Houses (28), for the R.D.C.; R. P. Brotton and Son, architects, Chop Gate, Middlesbrough.

Northampton.—Reconstruction of business premises, 42-48, Abington Street; F. W. Woolworth & Co., Ltd.

Nottingham.—School, clinic, canteen, &c., Bestwood (£206,216); education architect.

Orpington.—Houses (62), Northlands Avenue; Davis Estates, Ltd., Kilburn High Road.

Pontefract.—School, Carleton Park (£30,270); S. V. Smith, architect.

Radnorshire.—School, Knighton, for the County E.C.

Rugby.—Houses (300), Bilton Place estate; E. W. Sillito, Bilton Place estate. Houses (35), Pytchley Road, Little Farm estate; Dester Bros., Montrose Road, Rokeby estate.

Scarborough.—Houses (24), Scholes Park Cliff; C. J. Wilson, architect, Cross Lane. Boarding house, Burniston Road; C. W. Haynes, builder, Cleveland Avenue.

Sheffield.—Houses (22), Gleadless Road; W. Croft. Houses, Jaunty Lane, Wellwyn Road and Wellwyn Close; H. Seymour, 12, Cawthorne Grove. Houses (18), Norton Park View; J. Marsh & Sons, Ltd. Baths, North Quadrant; city architect. Totalisator, Lowther Road; Sheffield Sports Stadium, Ltd.

Shildon.—Recreational centre for the U.D.C.; W. A. Kellett, architect, 8, Lendal, York.

Shropshire.—Isolation hospital, Cross Houses, for the County C.C. School, Market Drayton; county architect.

Southall.—Factory and offices, Havelock Road; L. Clarke & Co., Ltd., Acme Works, Pluckington Place.

Sittingbourne (KENT).—Extensions to paper mills; E. Lloyds, Ltd.

Stalybridge.—Houses (46), Heyrod; Heyrod Estates, Ltd.

Stannington (NORTHUMBERLAND).—Homes for County Council (£59,831); J. G. Green and Sons, Ltd., contractors, The Butts, Warkworth.

Stockton-on-Tees.—Houses (230); S. H. Knolles, borough engineer and architect. Bakery, Bishopton Avenue, for R. Spark and Sons, Ltd., Marton Road, Middlesbrough.

Stoke-on-Trent.—Houses (178), Meir estate; C. & J. Seddon, Ltd. Cinema, Leek Road; H. D. Ship. Cinema, Stone Road, Trent Vale; Adam & Edwards, architects, Stafford Chambers, Glebe Street.

Sunderland.—Houses (112); E. Hitchen, R.D.C. surveyor. Four R.C. schools (£80,000); H. T. D. Hedley, architect, 49, Frederick Street. Alterations and additions to works of the Mayfair Confectionery Co.; G. E. Matkin, architect, Barclay's Bank Chambers.

Sunnybrow (Co. DURHAM).—Houses (50), for the North-Eastern Housing Association; Wetherell, Dent and Pickersgill, architects, Lloyds Bank Chambers, Barnard Castle.

Surrey.—Gymnasia, County school, East Sheen (£5,000), and County boys' school, Sutton (£4,500), and schools, Ash Vale (£28,020), Banstead (£17,648), Woodside, Malden (£27,137), Hillcross, Morden (£15,310), and Stoneleigh (£21,345), for the County E.C. Central laundry, Morden, for the County Council.

Swansea.—Fire station (£40,000); borough surveyor.

Tenterden (KENT).—Houses (20); borough surveyor.

Tunbridge Wells.—Houses (107), Southfield Park estate; Tunbridge Wells Investments, Ltd.

Wallasey.—Ice rink, shops and etc., Marine Promenade (£40,000); Mr. Wilkie.

Wallsend-on-Tyne.—Houses (142), Tynemouth Road, for North-Eastern Housing Association, Newcastle; P. L. Browne, Son and Harding, architects, Pearl Buildings, Newcastle-on-Tyne. Business premises, Coast Road, for Wallsend-on-Tyne Industrial Co-operative Society, Carville Road. Child welfare and maternity centre, for the T.C. (£22,000); Clements and Son, builders, Selborne Gardens, Newcastle-on-Tyne. Extensions to Central Library for T.C.; borough engineer.

Warkworth (NORTHUMBERLAND).—Houses (24), for Alnwick Rural District Council; O. M. Farrell, surveyor, Rural Council Offices, Alnwick.

Wellington (SHROPSHIRE).—School (£26,728); Harrison Smith Buildings, Ltd.

Whitby.—Houses (28), Stainsacre Lane, and Council offices and library, Stonehouse, for the U.D.C. (£28,000); W. Cornforth, builder, 1, Skinner Street.

Woking.—Maternity institution; Woking Health Society.

Workington.—Houses (24), Westfield estate, and improvements to bath and gymnasium; borough engineer.

Worthing.—Houses (42), Jupps Lane; Duncan E. Gray & Partners.

Yeovil.—Town hall (£110,000); T. C. Howitt, architect, St. Andrew's House, Mansfield.

Yorkshire.—Factory, Pontefract Road, Ferrybridge, for Robinson & Wordsworth (1925), Ltd.; Pennington, Hustler & Taylor, architects, Ropergate, Pontefract. School, Station Road, Stokesley, for North Riding C.C.; county architect, Northallerton.